P
Sc.
B

23

Report and Proceedings

OF THE

BELFAST

NATURAL HISTORY & PHILOSOPHICAL SOCIETY

FOR THE

SESSION 1893-94.

BELFAST:
PRINTED BY ALEXR. MAYNE & BOYD, 2 CORPORATION STREET
(PRINTERS TO QUEEN'S COLLEGE).

1894.

4.7.55

CONTENTS.

Belfast Natural History and Philosoqhical Society.

ESTABLISHED 1821.

SHAREHOLDERS.

1 Share in the Society costs £7.
2 Shares ,, cost £14.
3 Shares ,, cost £21.

The proprietor of 1 Share pays 10s. per annum; the proprietor of 2 Shares pays 5s. per annum; the proprietor of 3 or more Shares stands exempt from further payment.

Shareholders are only eligible for election ou the Council of Management.

MEMBERS.

There are two classes—Ordinary Members, who are expected to read papers, and Visiting Members, who, by joining under the latter title, are understood to intimate that they do not wish to read Papers. The Session for Lectures extends from November in one year till May in the succeeding one. Members, Ordinary or Visiting, pay £1 1s. per annum, due 1st November in each year.

Each Shareholder and Member has the right of personal attendance at all meetings of the Society, and of admitting a friend thereto; also of access to the Museum and Library for himself and family, with the privilege of granting admission orders for inspecting the collections to any friend not residing in Belfast.

Any further information can be obtained by application to the Secretary. It is requested that all accounts due by the Society be sent to the Treasurer.

The Museum, College Square North, is open daily from 10 till 4 o'clock. Admission for Strangers, 6d. each. The Curator is in constant attendance, and will take charge of any Donation kindly left for the Museum or Library.

Belfast Natural History and Philosophical Society.

ANNUAL REPORT, 1893.

The Annual Meeting was held in the Museum, College Square North, on Monday, 11th June, 1894. Amongst those present were—Professor Fitzgerald (in the chair); Messrs. R. L. Patterson, J.P.; R. Young, C.E., J.P.; T. Workman, J.P.; W. H. Patterson, R. M. Young (hon. sec.), Edward Allworthy, R. A. Kyle, W. Swanston, Robert Patterson, John Brown, J. H. Davies, Dr. J. MacCormac and Dr. J. A. Lindsay.

The Secretary read the notice convening the meeting, after which he submitted the annual report, which was as follows:—"The Council of the Belfast Natural History and Philosophical Society appointed by the shareholders at the last annual meeting on the 21st July, 1893, desire to submit their report of the working of the Society during the past year. The winter session was opened on 20th October, 1893, by a popular lecture, kindly given by Professor G. T. Stokes, D.D., in the Assembly's Hall, May Street, on 'St. Patrick and the Valley of the Boyne.' The second meeting was held on 2nd November, 1893, when Mr. L. L. Macassey, B.L., M.I.C.E., read a paper on 'The Mourne Scheme for the Water Supply of Belfast,' illustrated by diagrams and photo slides. The third meeting was held on 5th December, 1893, when the following communications were made:—1. Mr. A. Tate, M.I.C.E., report of the Society's delegate to British Association. 2. Mr. W. H. Patterson, M.R.I.A., 'A Notice of Ancient Shell Mounds at Rosapenna, County Donegal,' illustrated by finds.

3. Mr. Douglas Lithgow, 'Gossipings about the Parish of Saul.' 4. An exhibition of the latest phonograph, kindly given by Miss Susan Richardson. At the fourth meeting held on 19th December, 1893, in the Ulster Minor Hall, a popular scientific lecture was given by Mr. William M'Whirter, of Glasgow, on 'Electrical Cooking and other Modern Electrical Inventions.' The fifth meeting was held on 2nd January, 1894, when Mr. Conway Scott, C.E., read a paper on 'National Health,' followed by a discussion. The sixth meeting was held on 6th February, 1894, when Mr. G. M. Roche, of Dublin, gave a popular lecture on 'The American Mail Service (London and New York): Liverpool-Queenstown *v.* Southampton,' illustrated by 100 lantern views. The seventh meeting was held on 6th March, 1894, when the following papers were read:—1. Mr. Robert Patterson, hon. sec. Ulster Fauna Committee, 'Notes on the Occurrences of the Marten (*Martes Sylvatica*) in Ulster,' illustrated by specimens. 2. Mr. R. M. Young on 'A Recent Find of Irish Elk Bones, &c., in Belfast.' 3. Mr. Seaton F. Milligan, M.R.I.A., 'Social Pictures of Celtic Ireland,' illustrated by specimens from the lecturer's collection. The eighth meeting was held on 3rd April, 1894, when Professor Knight, LL.D., of St. Andrews, gave a lecture on 'The Higher Education of Women.' All the meetings, particularly the popular lectures, were well attended both by the members and the general public. In this connection your Council determined in last January to make a second effort to secure a course of Gilchrist lectures for next autumn. With the valuable assistance of Mr. John Horner, who succeeded in getting four other towns to join in the scheme, the requisition sent to the Gilchrist Trustees was favourably considered by them, and their secretary intimated that a series of six lectures, commencing on 28th September, 1894, will be given at intervals of a fortnight. The lecturers will comprise some of the leading scientists of the day, including Sir Robert Ball, Rev. Dr. Dallinger, Dr. Andrew Wilson, Dr. R. D. Roberts, &c. Their secretary met your Council on 23rd April, and explained how to make the lectures

successful, describing the modes adopted in various centres in England. He will again visit Belfast on 29th June, when a town meeting will be held to make further arrangements. As this is the first time that the Gilchrist lectures have been granted to Ireland, it is hoped that the action of the trustees will be fully justified by the success of the series in Belfast and other Ulster towns. It will be observed from the hon. treasurer's report that the finances of the Society are in a satisfactory state, a substantial balance remaining in his hands. A considerable number of new members have also joined the Society. The Society's meetings in the Museum show no diminution, and it is in contemplation to erect additional accommodation for the geological work carried on by the Belfast Naturalists' Field Club. Since the last annual meeting the Society has to deplore the loss of one of its best known and valued members, the late Joseph John Murphy. He was a member of your Council for over forty-one years, and president for several years. At the public meeting of the Society held on the 6th February last, a vote of condolence was passed to his relatives, on the motion of Mr. R. L. Patterson, J.P., vice-president. Your Council have co-opted Mr. Lavens M. Ewart, J.P., to fill the vacancy caused by the death of Mr. Murphy. The Museum was opened on Easter Monday and Tuesday at the usual nominal charge. Several novelties were displayed, including some living Irish animals, and the attendance of visitors exhibited a gratifying increase. Mr. Roberts, who was appointed assistant-curator last autumn, having resigned in April, Mr. R. Robinson has been taken on trial as his successor. The Curator continues to discharge his duties with much efficiency. A list of donations to the Museum, and of publications received in exchange from home and foreign societies will be printed with the present report. Amongst the donations may be specially noted the excellent portrait, in oil, of our Curator, kindly presented by the artist, Miss S. M. Thompson, and the interesting stone carvings from Saul Abbey given by Mr. Douglas Lithgow. The Council desire to tender their best

thanks to the Press for their admirable reports of the Society's proceedings.

This meeting will be asked to elect five members of Council in place of the following gentlemen, who retire in accordance with the new constitution, four of whom are eligible for re-election—viz., Mr. Thomas Workman, J.P.; Mr. Robert M. Young, Professor J. D. Everett, F.R.S.; and Mr. Lavens M. Ewart, J.P.

The donations to the Museum, 1st May, 1893, till 1st May, 1894.—From Mr. Herman Hoell, barque Dovre, four king crabs from Florida; from Mrs. Jenkins, specimen of a rare cuttle fish (*Rosia Macrosoma*), from Helen's Bay; from Moses Atkinson, the sword of a Lisburn volunteer; from Mr. J. Beck, Donegore, a spindle whorl found in Donegore Moat; from Thomas Workman, J.P., a number of shells from Singapore; coleoptera from Madagascar; and model of an Esquimaux kayak; from the Misses Watson, Ballybandon, two sepulchral urns, found near Killinchy, filled with human bones; from W. Swanston, F.G.S., a trooper's flint-lock pistol; from Mr. J. Liddle, Cookstown, a collection of fossil fish teeth, from rocks near Cookstown; from Capt. R. Campbell, stuffed specimen of mongoose killing a snake; from Mr. Donald Cameron, fossil bones from the Pampas, Tandiel; from Miss S. M. Thompson, fossils and rock specimens from Howth; also, oil painting portrait, "A Northern Botanist;" from Mr. Thomas Carter, a wooden mether filled with bog butter, found in a bog near Portadown; from Mr. D. M'Clelland, horn of a doe, found in gravel at Orlock; from Mr. Andrew Peden, a pike, found at Donegore Hill; also a breastplate worn by Donegore Yeoman Infantry; from Rev. George Hill, portion of the fringe of an ancient Irish garment; from Mr. Wallace, Otago, green-stone adze from New Zealand; from Belfast Water Commissioners, two large specimens of petrified wood from Stoneyford; from Belfast Naturalists' Field Club, a volume of specimens of dried plants; from Mr. W. H. Patterson, M.R.I.A., specimens of bones and shells from shell mounds at Rosapenna; from Mr.

R. M. Young, M.R.I.A., bones of Irish elk, &c., dug up in Castle Place; from Miss Chermside, wings of locusts from Natal; from Messrs. Fitzpatrick & Co., human skull, dug up in Royal Avenue; from Mr. S. F. Milligan, M.R.I.A., bones of various animals, dug up in Castle Place."

The Secretary of the Ulster Fauna Committee reports that steady progress has been made during the year. The correspondence connected with the work has taken a considerable amount of time, and several important facts have been brought to light. Our knowledge of the breeding-range of Irish birds is steadily increasing. Information about Irish mammals being difficult to obtain, it has been thought advisable to take up each one separately and work out its occurrences and distribution. This has been done in the case of the marten, and a copy of the paper is on the table. To obtain this information alone eighty-three letters were specially written—a labour which many might consider not worth the result. Our observers are increasing, and general interest is expressed in our work, which can be much aided by the co-operation of the members of the Belfast Natural History and Philosophical Society.

Mr. John Brown, hon. treasurer, submitted the statement of accounts, which showed a balance of £10 2s. 2d. in favour of the Society.

Mr. J. H. Davies moved the adoption of the report and statement of accounts. He said there seemed to be an increased interest in the Society, and he hoped that that interest would continue.

Dr. MacCormac seconded the motion, which was passed.

Mr. R. L. Patterson, having made a statement with reference to the securities of the Society, &c.,

The election of five members for the Council in place of those now retiring took place, the scrutineers being Mr. Patterson and Mr. Swanston. The election resulted as follows:—Mr. Thomas Workman, Mr. R. M. Young, Professor Everett, Mr. John Horner, and Mr. L. M. Ewart.

The SECRETARY then read the following list of lectures to be given in Belfast in connection with the Gilchrist Trust:—28th September, Professor V. B. Lewes, "Our Atmosphere and its Relation to Life;" 12th October, Professor Sir Robert Ball, F.R.S., "Recent Discoveries about the Sun;" 26th October, Rev. Dr. Dallinger, F.R.S., "Spiders: Their Work and Their Wisdom;" 9th November, Dr. R. D. Roberts, D.Sc., &c., "The Evolution of the British Isles;" 23rd November, A. P. Laurie, M.A., "Waves of Water and Waves of Light;" 7th December, Dr. Andrew Wilson, 'Brain and Nerve and their Work."

The CHAIRMAN hoped that they would all do their utmost to promote the success of the lectures.

On the motion of Mr. PATTERSON, seconded by Mr. WORKMAN, a cordial vote of thanks was passed to Professor Fitzgerald, who now retires from the presidentship of the Society, for the manner in which he had conducted their meetings during the past three years, and

The compliment having been acknowledged in appropriate terms,

The proceedings terminated.

EDUCATIONAL ENDOWMENTS (IRELAND) ACT, 1885, 48 & 49 Vict., ch. 78.

The Account of the Council of the Belfast Natural History and Philosophical Society for the year ended 30th April, 1894.

Dr. **Cr.**

CHARGE.

				£	s.	d.
To Amount of Donations, Bequests, and other Endowments received in the year ended 30th April, 1894				£0	9	0
,, Amount of Subscriptions received in the year ended 30th April, 1894				136	17	0
,, Amount of Dividends received in the year ended 30th April, 1894				17	9	11
,, Amount of Rents received in the year ended 30th April, 1894				35	0	6
,, Amount of Fees received in the year ended 30th April, 1894				0	5	6
,, Amount realized by Sales in the year ended 30th April, 1894				2	14	6
,, Amount of Miscellaneous Receipts in the year ended 30th April, 1894 (not included in the foregoing), viz.:—						
Entrance fees at door on Easter Monday	£27	6	1			
Do. do. Tuesday	5	13	4			
Do. do. May 1, '93, to April 30, '94	22	17	3			
				55	16	8
Total				£248	13	1

DISCHARGE.

				£	s.	d.
By Balance due Treasurer, April 30th, 1893 ...				£14	6	8
,, Amount of Payments made in the year ended 30th April, 1894, under the following headings—						
Maintenance of Premises, &c. ...	£20	15	$2\frac{1}{2}$			
Rent and Taxes, &c.	27	11	0			
Salaries	87	10	3			
				135	16	$5\frac{1}{2}$
Other Payments, viz.—						
Printing and Stationery	10	18	8			
Advertising	9	0	1			
Postage and Carriage	6	0	$8\frac{1}{2}$			
Fuel and Gas	15	14	7			
Insurance	2	12	6			
Auditor's Fee	1	1	0			
Model of Curragh purchased ...	0	3	4			
Subscription to *Irish Naturalist* ..	3	3	0			
Prof. Knight's Travelling Expenses	2	8	0			
Expenses at Easter	8	7	5			
Printing Report	20	9	0			
Popular Lecture Account	8	9	6			
				88	7	$9\frac{1}{2}$
Total Payment				£238	10	11
,, Balance in favour of this Account on 30th April, 1894				10	2	2
Total				£248	13	1

N.B.—Besides the above Balance there is a sum of £400 standing to the credit of this Account in the York Street Spinning Co., Ltd., $4\frac{1}{2}$ per cent. Debenture Stock.

We certify that the above is a true Account.

MAURICE F. FITZGERALD, Governor.
J. BROWN, Accounting Officer.

I certify that the foregoing Account is correct.
J. F. MAYNE, Auditor.
30th day of June, 1894.

Dated this 26th day of May, 1894.

DONATIONS TO THE MUSEUM, 1893-94.

From Mr. Herman Hoel. Barque "Dovre."

Four king crabs, from Florida.

From Mrs. Jenkins.

A rare cuttle-fish (*Rossia macrosoma*) taken at Helen's Bay.

From Moses Atkinson, Esq.

The sword of a Lisburn volunteer.

From J. Beck, Esq., Donegore.

A spindle whorl found in the souterrain under Donegore moat.

From The Misses Watson, Ballybundon.

Two sepulchral urns, dug up in a field near Killinchy.

From Thos. Workman, Esq., J.P.

A model of an Esquimaux kayak, also specimens of *Coleoptera* from Madagascar, and shells (*Auricula*, *Terebralia*, *Potamides*, etc.) from Singapore

From Wm. Swanston, Esq., F.G.S.

Old cavalry pistol with flint lock

From J. Liddle, Esq., Cookstown.

A collection of fossil fish palates from Carboniferous rocks near Cookstown.

From Capt. Campbell. Ship "Slieve Donard."

A stuffed mongoose in the act of killing a cobra.

From Donald Cameron, Esq.

Fossil bones from the Pampas near Tandiel, Buenos Ayres.

From Miss Sydney M. Thompson.

Oil portrait—"A northern botanist", also fossil specimens from rocks at Howth.

From Thomas Carter, Esq.

An ancient wooden mether found, filled with butter, in a bog near Portadown.

From Mr. D. M'Clelland.

Horn of a doe found in gravel at Orlock.

From Andrew Peden, Esq.

A pikehead found near Donegore Hill, and a breastplate worn by Donegore yeoman infantry.

From Rev. George Hill.

Portion of the fringe of an ancient Irish mantle, dug up in a bog between Moyarget and Ballintoy, Co. Antrim.

From Mr. Wallace, Otago.

An adze made of jade, from New Zealand.

From The Belfast Water Commissioners.

Two large specimens of silicified wood found in clay at Stoneyford.

From Belfast Naturalists' Field Club.

A volume of specimens of dried plants.

From W. H. Patterson, Esq., M.R.I.A.

Human and other bones and also shells from kitchen midden at Rosapenna, Co. Donegal.

From R. M. Young, Esq. M.R.I.A.

Bones of *Megaceros*, etc., dug up in Castle Place, Belfast, at a depth of 7 feet.

From S. F. Milligan, Esq., M.R.I.A.

Bones of dog, horse, etc., dug up in Castle Place, Belfast.

From Miss Chermside, Albion Place.

A number of wings of locusts from Durban, Natal.

From Messrs. Fitzpatrick & Co.

A human skull found when excavating at Messrs. Steel's premises in Royal Avenue.

From Douglas Lithgow, Esq.

Two carved stones from Saul Abbey, Co. Down.

ADDITIONS TO THE LIBRARY, 1ST MAY, 1893, TILL 1ST MAY, 1894.

ADELAIDE.—Transactions of the Royal Society of South Australia. Vol. 16, part 2, 1893; and vol. 17, parts 1 and 2, 1893. *The Society.*

AUSTIN, Texas.—Transactions of the Texas Academy of Science. Vol. 1, no. 2, 1893. *The Academy.*

Definitions of the Trigonometric Functions. By Professor A. Macfarlane, D.Sc., LL.D. *The Author.*

BELFAST.—Proceedings of the Belfast Naturalists Field Club. Ser. 2, vol. 3, part 6, 1892-3. *The Club.*

BERGEN.—Bergens Museums Aarbog, 1892. *The Museum.*

BERLIN.—Verhandlungen der Gesellschaft für Erdkunde zu Berlin. Vol. 20, parts 4-7, and part 10, 1893; and vol. 21, parts 1-3, 1894. *The Society.*

BIRMINGHAM.—Proceedings of the Birmingham Philosophical Society. Vol. 8, part 2, 1892-93; and Annual Report, 1893. *The Society.*

BOLOGNA.—Rendiconto delle Sessioni della R. Accademia delle Scienze dell Istituto di Bologna. Anno, 1891-2. *The Academy.*

BOSTON.—Proceedings of the Boston Society of Natural History. Vol. 26, part 1, 1893. *The Society.*

Occasional Papers—Geology of the Boston Basin. Vol. 1, part 1, 1893; and maps.

Memoirs of the Boston Society of Natural History. Vol. 4, no. 11, 1893. *The Society.*

BREMEN.—Abhandlungen herausgegeben vom Naturwissenschaftlichen Vereine zu Bremen. Vol. 12, part 3; also Ubersicht, two supplements. Vol. 13, part 1, 1894. *The Society.*

BRESLAU.—Zeitschrift für Entomologie herausgegeben vom Verein für Schlessiche Insektenkunde zu Breslau. New Series, part 18, 1893.
The Society.

BRIGHTON.—Annual Report of the Brighton and Sussex Natural History and Philosophical Society, 1893. *The Society.*

BRUSSELS.—Annales de la Société Royale Malacologique de Belgique. Vol. 26, 1891.

Procès-Verbaux des Séances. Vol. 21, Jany.-Aug., 1892. *The Society.*

CALCUTTA.—Records of the Geological Survey of India. Vol. 24, parts 2-4, 1893.
The Director of the Survey.

Memoirs (Palæontologica Indica) II. Part 1, 1893.

Manual of the Geology of India (Oldham). 2nd edition, 1893.

CAMBRIDGE.—Proceedings of the Cambridge Philosophical Society. Vol. 8, parts 1 and 2, 1893-4.
The Society.

CAMBRIDGE, U.S.A.—Bulletin of the Museum of Comparative Zoology. Vol. 16, nos. 12-14, 1893; vol. 24, nos. 3-7; vol. 25, nos. 1-6, 1893-4; also Report of the Curator, 1892-93.
Alex. Agassiz, Curator.

CARDIFF.—Report and Transactions of the Cardiff Naturalists' Society. Vol. 24, part 2; and vol. 25, parts 1 and 2, 1893-94. *The Society.*

CHRISTIANIA.—Forhandlinger i Videnskabs Selskabet i Christiania. Nos. 1-11, 1891; nos. 1-18, 1892; also Oversigt 1891; Oversigt 1893; and Briefe Abhandlungen und Predigten, 1890.
The Royal University of Christiania.

CHERBOURG.—Memories de la Société Nationale des sciences Naturelles et Mathematiques de Cherbourg. Vol. 28, 1892. *The Society.*

DAVENPORT, U.S.A.—Proceedings of the Davenport Academy of Natural Science. Vol. 5, part 2, 1893. *The Academy.*

EDINBURGH.—Proceeedings of the Royal Society of Edinburgh. Vol. 19, 1891-2. *The Society.*

Transactions and Proceedings of the Botanical Society of Edinburgh. Vol. 19, part 3. *The Society.*

EMDEN.—Jahresbericht der Naturforschenden Gesellschaft in Emden, 1891-92. *The Society.*

ESSEX.—The Essex Naturalist and Journal of the Essex Field Club. Vol. 7, nos. 1-12, 1893. *The Club.*

FLORENCE.—Bullettino della Societa Entomologica Italiana. Parts 1-4, 1893; part 1, 1894; also Processi Verbali, 1892, and Statuto, 1894. *The Society.*

FRANKFURT.—Bericht über die Senckenbergische naturforschende Gesellschaft in Frankfurt am Main, 1893; also Katalog der Reptiliensammlung in Frankfurt Museum. *The Society.*

GLASGOW.—Transactions of the Geological Society of Glasgow. Vol. 9, part 2, 1893. *The Society.*

Proceedings of the Philosophical Society of Glasgow. Vol. 24, 1893. *The Society.*

GIESSEN.—Neunundzwanzigster Bericht der Oberhessischen Gesellschaft für Natur und Heilkunde. 1893. *The Society.*

GÖRLITZ.—Abhandlungen der Naturforschenden Gesellschaft zu Görlitz. 1893. Zwanzigster Band. *The Society.*

HALIFAX, N.S.—Proceedings and Transactions of the Nova Scotian Institute of Science. Vol. 1, part 2, 1892. *The Institute.*

HALLE.—Leopoldina, Amtliches Organ der Kaiserlichen Leopoldino-carolinischen Deutschen Akademie der Naturforscher Achtundzwanzigster heft, 1892. *The Academy.*

KIEW.—Memoires de la Société des Naturalistes de Kiew. Vol. 12, parts 1 and 2, 1892; vol. 15, 1893; and vol. 18, part 1, 1893. *The Society.*

KHARKOW.—Travaux de la Société des Sciences Experimentales a l'Université de Kharkoff. Vol. 20, 3 parts, 1892-93 *The Society.*

LAUSANNE.—Bulletin de la Société Vaudoise des Sciences Naturelles. Vol. 29, Nos. 110-113, 1893. *The Society.*

LEIPSIC.—Mitteilungen des Vereins für Erdkunde zu Leipzig. 1892. *The Society.*

LONDON.—Quarterly Journal of the Geological Society. Vol. 49, parts 2-4, 1893; and vol. 50, part 1, 1894; also, List of Fellows for 1893. *The Society.*

Journal of the Royal Microscopical Society, parts 3-6, 1893; and part 1, 1894. *The Society.*

Transactions of the Zoological Society of London. Vol. 13, parts 5-8, 1893-94. Proceedings, part 4, 1892; parts 1-4, 1893-94. *The Society.*

MANCHESTER.—Journal of the Manchester Geographical Society. Vol. 8, nos. 4 12, 1892; vol. 9, nos. 1-6, 1893. *The Society.*

Transactions of the Manchester Geological Society. Vol. 22, parts 8-15, 1893-94. *The Society.*

MELBOURNE.—Proceedings of the Royal Society of Victoria. Vol. 5, 1893; and vol. 6, 1894. *The Society.*

MADISON, U.S.A.—Transactions of the Wisconsin Academy of Science, Arts, and Letters. Vol. 9, parts 1 and 2, 1893. *The Academy.*

MERIDEN, CONN., U.S.A.—Meriden Scientific Association; Annual Address, 1892. *The Association.*

MEXICO.—Annario del Observatorio Astronomico Nacional de Tacubaya. Ano 14, 1893, and Boletin, vol. 1, nos. 13, 14, and 16, 1883. *The Director.*

MOSCOW.—Bulletin de la Société Impériale des Naturalistes de Moscou. Nos. 1-3, 1893. *The Society.*

MADRAS.—Report of the Government Central Museum, for the year 1892-3.
The Superintendent of the Museum.

NEW YORK.—Annals of the New York Academy of Sciences. Vol. 7, nos. 1-5, and vol. 8, nos. 1-3, 1893.
The Academy.

Bulletin of the American Geographical Society. Vol. 24, no. 4, part 2, 1892; vol. 25, nos. 1-4, 1893. *The Society.*

NANTES.—Bulletin de la Société des Sciences Naturelles de L'ouest de la France. Vol. 3, nos. 1-4, 1893.
The Society.

OTTAWA.—Geological Survey of Canada; Annual Report. Vol. 5, parts 1 and 2, and 5 maps, 1893. Catalogue of Section I. of the Museum, 1893; also catalogue of a stratigraphical collection of Canadian Rocks, 1893. *The Director.*

PADUA.—Atti della Societa Veneto-Trentina di Scienze Naturali in Padova. Series 2, vol. 1, fasc. 2, 1894; and Bullettino. Vol. 5, no. 3, 1893.
The Society.

PHILADELPHIA.—Proceedings of the Academy of Natural Sciences of Philadelphia. Part 3, 1892, and parts 1 and 2, 1893. *The Academy.*

Proceedings of the American Philosophical Society. Vol. 31, nos. 140-141, 1893. *The Society.*

Transactions of the Wagner Free Institute of Science. Vol. 3, part 2, 1892. *The Institute.*

PISA.—Atti della Società Toscana di Scienze Naturali Processa Verbali. May, 1893, till January, 1894.
The Society.

ROME.—Atti della Reale Accademia dei Lincei. Vol. 2, 1 semestre, fasc. 7-12, 1893; and 2nd semestre, fasc. 1-12, 1893; vol. 3, 1st semestre, fasc, 1-7, 1894. *The Academy.*

Bollettini della Societa Romana per gli Studi Zoologici. Vol. 2, parts 1-8, 1893.
The Society.

Journal of the British and American Archæological Society of Rome. Vol. 2, no. 3, 1893.
The Society.

ROCHESTER, N.Y.—Proceedings of the Rochester Academy of Science. Vol. 2, part 2, 1893.
The Academy.

REIGATE.—Proc. of the Holmesdale Natural History Club for 1890-92. *The Club.*

STOCKHOLM.—Royal Swedish Academy; Handlinger. New series, vol. 22, parts 1 and 2, 1886-87; vol. 23, parts 1 and 2, 1888-89; vol. 24, parts 1 and 2, 1890-91; Bihang. Vols. 14 to 18, in 20 parts, 1889-93; Öfversight. No. 46, 1889; no. 47, 1890; no. 48, 1891; no. 49, 1892; Lefnadsteckningar Vol. 3, part 1, 1891; Förteckning ofver innehallet, 1826-83, 1884. *The Academy.*

SAN FRANCISCO.—Procedings of the California Academy of Sciences. Series 2, vol. 3, part 2, 1893; Occasional Papers. Vol. 3 and 4, 1893.
The Academy.

SANTIAGO DE CHILE.—Verhandlungen des Deutschen Wissenschaftlichen Vereines. Vol. 2, parts 5 and 6, 1893. *The Society.*

STAVANGER.—Stavanger Museums Aarsbereting for 1892.
The Trustees.

TOKIO.—Mittielungen der Deutschen Gesellschaft für Natur- und Volkerunde Ostasiens in Tokio. Vol. 6, parts 51, 53, 1893. *The Society.*

TOPEKA, U.S.A.—Transactions of the Kansas Academy of Science. Vol. 13, 1891-92. *The Academy.*

TORONTO.—Transactions of the Canadian Institute. Vol. 3, part 2, 1893, and 5th Annual Report, 1892-3. *The Institute.*

TRIESTE.—Bollettino della Societa Adriatica di Scienze Natural. Vol. 14, 1893. *The Society.*

VENICE.—La Notarisia Commentario Ficologico. Nos. 1-6, 1893. *The Editor.*

VIENNA.—Verhandlungen der Kaiserlich-Koniglichen Geologischen Reichsanstalt. Nos. 2-18, 1893; and nos. 1-4, 1894. *The Society.*

Verhandlungen der Kaiserlich-Koniglichen Zoologische-Botanischen Gesellschaft in Wein. Vol. 43, parts 1 and 2, 1893. *The Society.*

Jahres-Katalog pro 1894, des Wiener Botanischen Tauschivereines. *The Society.*

WASHINGTON.—United States Geological Survey, Annual Report, 1889-1890. Part 1, Geology; part 2, Irrigation. Bulletins, nos. 82-85, 1891-92. Mineral Resources of the United States. 1891. Monographs, no. 17, Flora of the Dakota Group, 1891; no, 18, Gastropoda and Cephalopoda of the Raritan Clays and Greensand Marls of New Jersey, 1892; no. 20, Geology of the Eureka District of Nevada, 1892. *The Director.*

Smithsonian Publications. Report of the United States National Museum, 1890. Bulletins of the Museum, no. 39, parts a to g, 1891-92, and no. 40, 1892. Smithsonian Contributions to Knowledge, no. 842, The Application of Inter-

ference Methods to Spectroscopic Measurements, 1892. Miscellaneous Collections, vols. 34 and 36, 1893. Bureau of Ethnology, Annual Reports, 1886-87 and 1887-88. Bibliography of the Chinookan and Salishan Languages, 1893. Annual Report of the American Historical Association, 1891. United States Department of Agriculture, Report of the Secretary, 1891. Division of Ornithology and Mammology, Bulletins 3 and 4. Division of Botany, vol. 4, 1893, and vol. 1, no. 8, 1893. Contributions from the United States National Herbarium, vol. 4, 1893, and vol. 1, no. 8, 1893, Transactions of the Anthropological Society of Washington, vol. 3, 1885.

The Institution.

YORK.—Reports of the Yorkshire Philosophical Society, 1892 and 1893. *The Society.*

ZURICH.—Vierteljahrschrift der Naturforschenden Gesellschaft in Zurich. Parts 3 and 4, 1892, and 1-4, 1893: Neujahrsblatt, 1893. *The Society.*

From ROBT. LLOYD PATTERSON, Esq., J.P., F.L.S.—Proceedings of the Linnean Society, 5 parts, 1883-92. Journal of the Society—Botany, vol. 20, nos. 130 and 131, and vols. 21-25. Also Zoology, vol. 18, vol. 19, parts 108-113 and 115, vol. 20, parts 116-125 ; vol. 21, parts 126-131 ; vols. 22 and 23, and vol. 24, parts 149-156, 1884-1893. Meyen's Botanical Geography, 1846.

From THOS. WORKMAN, Esq., J.P.—Exploration Scientifique de la Tunisie, 2 parts 8vo. and 1 part folio (figures of cretaceous fossils).

From G A. Holt, Esq., Manchester.—Vasey's Monograph of the Grasses of the South-west of the United States, 2 vols., 1890-91. Also, Grasses of the Pacific Slope, 2 vols., 1892-93. Agricultural Grasses and Forage Plants of the United States, and Contributions to the United States National Herbarium, 2 parts, 1892-93.

BELFAST
NATURAL HISTORY & PHILOSOPHICAL SOCIETY
SESSION 1893-4.

20th October, 1893.

PROFESSOR M. F. FITZGERALD, B.A., M.I.C.E., President, in the Chair.

Rev. Dr. STOKES, M.R.I.A. Professor of Ecclesiastical History, T.C.D., delivered a lecture, entitled

"ST. PATRICK AND THE VALLEY OF THE BOYNE."

REV. DR. STOKES, who was cordially received, said it had been oftentimes remarked that Irishmen had been incurious about their own country, about their own antiquities, about their own nationality, and the thing was too true. If they wanted to know how true it was, let them ask how many people in that room had ever seen that most wonderful specimen of caligraphy in the world, the Book of Kells, and he ventured to say that the people who had seen it were very few—he could count them on the fingers of both hands—and yet that wonderful book lay for inspection by every visitor to the library of Trinity College, Dublin. They treated such antiquities with the supremest neglect, although, at the same time, the very men who treated the Irish antiquities with neglect would be found crowding the Royal Academy in London, or crowding the museums of France and Germany. How many persons had ever visited the valley of the Boyne, and crossed it, the place which changed the history of Europe? And yet Lord Macauley

thought it worth while to come and spend his holidays in that most beautiful valley. He lost patience here with the Irish people, for thousands amongst them went every year to visit England, and hundreds of Belfast people were to be found every year at Harrogate enjoying its springs. And yet those very people had not seen the mountains around Lough Derg, and in the centre of Ireland, which was about two hours' run from this city, the scene of the wanderings of St. Patrick in the valley of the Boyne. But they were not the offenders. The offenders were the directors of the Irish railways. He hoped if there was one present that evening that he would search his own heart and examine his own conscience, and confess in the most primitive Christian manner before this congregation. Irish traditions stated that St. Patrick was a gentleman and that he came of decent people. About the years 431 or 432 St. Patrick sailed from France to Ireland. He first landed at the point of Wicklow where there was a great strand, called the Murrow. Wicklow was greatly resorted to at the present day by riders of horses and for the manœuvres of the Dublin and Wicklow Militia Artillery. The Irish people did not receive St. Patrick very cordially when he landed. They saluted him with volleys of stones, one of which struck one of his companions. He laboured there and founded a church, and then wandered along the East coast of Ireland for a few months. Then about the spring of the year 431 or the year 432 he landed at the River Boyne, and proceeded to survey the shores and to examine its beauties. He might inform them that the Boyne sprang from a well dedicated to the Holy Trinity, about which there was a curious legend, namely, that if anyone went near that well except the King he or she should lose their sight. However, a body of men called the Irish Ecclesiastical Committee were formed in Ireland, and he might say that they were even worse than the Danes. They destroyed everything, even sanctuaries, but they vanished off the face of the earth. St. Patrick sailed as far up the Boyne as he could, when he was stopped by the rapids which were on the river in every direction. He travelled in a

kind of boat called a coracle, and they could still see some of those peculiar boats used on the South and West coasts of Ireland, and not only there but on the Shannon. The first spot he came to was that on which modern Drogheda now stood, and he afterwards came to Oldbridge, where a monument marks the spot where King William was wounded by a cannon ball on the evening of the 1st July, 1690. It might not be exactly known how that battle was won. The night before the battle of the Boyne King William was informed that there would be a difficulty in getting across the Boyne in consequence of there being only one bridge at Slane, which, however, was guarded by a small body of men under King James. He accordingly sent the Duke Schomberg's son, with twelve thousand men, who on the following morning, in conjunction with King William's force, completely crushed the six hundred men who guarded the bridge, and secured the place. There was a place above that called Rossnaree, St. Patrick followed on to Slane. Doubtless a ford existed where the bridge remains. He was seeking Tara, the capital of the country, and he selected the hill of Tara, which was then the highest hill in the County of Meath, and on that hill he raised up a statue against Celtic paganism. Looking up the Boyne, they could behold a series of views which were unsurpassed in Ireland for beauty. They could go along the Boyne's banks, either in the early spring, when the primroses decorated the ground, or else when it lay sweltering beneath the summer sun, or in the autumn, or in the middle of winter, and they would find a place along the banks of the Boyne rich in all things which could alone interest them. There was a house erected in that place for the reception of George IV. He considered it a pity that the Royal visits should be so infrequent that houses had to be erected for their reception. The ruins of Castle Dexter and Dunmore Castle could be seen further up. In fact, the whole banks of the Boyne were marked by one long series of castles, placed there by the Norman conquerors, and proving that the Boyne was for some time a very important boundary to the English.

Some of them were magnificent specimens for an archæologist, rivalling the ruins of Conway and Carnarvon themselves. If they took a tour round the Boyne they would thank the lecturer for having told them of St. Patrick and the valley of the Boyne.

The lecture was profusely illustrated by special lantern slides, the lantern being manipulated by Mr. James M'Cleery, of the Y.M.C.A. Camera Club. Some of the illustrations were of the raths, round towers, and cromlechs at present in existence, of which the lecturer gave a very clear explanation.

Mr. W. Gray moved a vote of thanks to the lecturer, and in doing so said he had accompanied him on some of his archæological excursions, and he had always found him to be a very pleasant and agreeable companion. They all hoped it would not be the last time that he would favour them with a lecture.

Mr. W. H. Patterson seconded the motion, which was passed by acclamation.

2nd November, 1893.

PROFESSOR FITZGERALD, B.A., M.I.C.E., President, in the Chair.

MR. L. L. MACASSEY, B.L., C.E., gave a Lecture on

THE MOURNE WATER SCHEME.

THE LECTURER, in opening, said he only intended to give a brief description of the salient points of the scheme sanctioned by Parliament during the last summer. Having regard to the season of drought through which they had just passed, it would, he thought, be deemed a wise and proper measure on the part of the Commissioners to augment their supply. The population of Belfast was about 280,000, of which 260,000 were within the borough proper. The quantity of water consumed by them was 36 gallons per head per day, which, though it looked liberal, was not an extravagant supply considering that it covered both domestic and manufacturing wants. In Dublin the consumption was 40 gallons per day per individual, while in Glasgow it was something like 50 gallons. The Commissioners found the population and requirements of the city increasing, and determined to secure a supply of water which would enable them to meet any contingencies for some years to come. Every district capable of affording a good supply in the counties of Antrim and Down had been carefully examined, and it was only after a very painstaking comparison that the Mourne scheme was adopted. By the Act of 1893 the Commissioners took control over 9,000 acres of gathering ground in the Mourne Mountain district, embracing the Kilkeel and Annalong Rivers. The rainfall in this district was considerably greater than that in Belfast owing to the greater elevation.

In Belfast the average rainfall in the year, taken from the gauge at the Queen's College, was some 34 or 34½ inches, but in the neighbourhood whence it was proposed to take the water—some 1,500 feet above the ordnance datum of low water—it was much more. For instance, in the past year, which, as they knew, had been a dry one, the rainfall in Belfast had been 28 inches, while on the mean level of the proposed catchment area it was 54 inches. Allowing 15 inches as a margin for waste there would be 39 inches left as water which might be collectable. A further deduction, however, must be made for very heavy floods, the water of which could not be stored. Therefore a calculation was based on a rainfall of 28 inches, which gave something like 16,000,000 or 17,000,000 gallons per day. The gross consumption in Belfast at present was from 10,000,000 to 10,500,000 gallons per day, so that the new supply would enable the Commissioners to satisfy the wants of a population more than double that of Belfast at present. But, in addition, other catchment areas adjacent might be taken in if occasion arose, and a supply of water amounting to 30,000,000 gallons a day could be brought into the city. So that, though the scheme as at present contemplated was an ample one for all estimated future wants, it was also an expansible one which could be made to meet the most severe demands upon it due to the rapid growth of population during the next half century. The character of the district was one well suited to the purposes of a water supply. The slopes generally are steep, and, though there are patches of bog, one of the worst of these patches was excluded from the area over which the Commissioners had taken control. The water, however, might be slightly coloured by peat. But, judging from results, it seemed as if the sand carried down from the higher levels, which were particularly sandy, acted in the course of the water in such a way as to carry the peat down and subside it. In a valley called the Happy Valley, or Silent Valley, it was proposed to construct a large reservoir. This reservoir would be about two hundred acres of water surface, seventy feet deep against the

embankment—about the same depth as the deepest reservoir at Woodburn. The embankment is five hundred yards long, and the maximum depth of the reservoir would be eighty-five feet. Its capacity would be something like two thousand million gallons. This would represent about the total capacity of all the Commissioners' reservoirs at Carrickfergus and Stoneyford. The Commissioners had also the power to make a reservoir in the Annalong valley, though they did not propose to do so just now. The only condition by which the Commissioners were bound in reference to water rights was to give a supply to the village of Kilkeel—a condition which Lord Kilmorey, the owner of the land, desired to have made. There were no mills or farms to be supplied, and in fact there would be no waste or alienation of any considerable part of the water. The Commissioners had succeeded in doing what no other corporation in England or Scotland had done—namely, to get the water rights almost totally devoid of the usual obligations as to supply to adjacent interests. With regard to the quality of the water, most satisfactory reports upon analysis had been issued by Mr. Robert Barklie and Professor Dewar. The latter eminent authority—the most eminent probably on water questions—had gone over the whole district and examined it thoroughly. He described it as one of the most favourable districts for a water supply he had ever seen. The lecturer then described the method of construction of the conduit which is to bring the water from the district to Belfast. The main conduit will be 34½ miles in length, of which 16¼ miles is what is technically known as "cut and cover," 12 miles steel pipes and the balance of 6¼ miles is tunnel. The interior of the conduit in both "cut and cover" and tunnel portions will be concrete. A service reservoir will be constructed at the "Half-way House" on the Ballynahinch Road, some three or four miles from Belfast. It will have a capacity of some 70 million gallons, or about a week's supply at the present rate. The Commissioners have obtained powers to discharge water into all rivers along their line so that there will be no difficulty with flooding, &c.

It is not proposed to construct this large reservoir in the Happy Valley immediately. The first object is to make the conduit and establish connection between these rivers and the town, so that a large amount of water could be brought in without being stored—water obtained from the ordinary flow of the rivers. It is estimated that the work will cost about £750,000, and having regard to the large sums which have been and are being expended in towns like Glasgow, Liverpool, Birmingham, and Manchester, the expense for the quantity of water available is very moderate, simply because the circumstances are very favourable in this district as compared with many others. In conclusion, the lecturer paid a high tribute to the care, intelligence, foresight, and watchfulness exhibited by the Commissioners and by their able Secretary, Mr. Hamilton, in connection with the scheme and the negotiations necessary to secure its authorisation by Parliament. He also spoke highly of the former services to the Trust of the late Mr. Colligan, and expressed the belief that the death of that gentleman was deeply regretted by all his brother Commissioners, and regarded by them as a real loss to the Trust.

Professor FitzGerald — Before calling upon any of the gentlemen to take part in the discussion, I will read a letter which Mr. Young has received from Professor Letts. It is as follows :—" I very much regret that I cannot be at the Museum this evening, and so shall miss the pleasure of hearing Mr. Macassey's paper, which I am sure will be most interesting. I should have liked to say a few words in the discussion following the paper, because, as you know, I take a great interest in the subject of the Belfast water supply, and have some very strong opinions on the subject, which I have not hesitated to express. As I cannot be present in person, may I ask you to read to the meeting the following remarks:—In the first place, I very much regret to say that the present supply, bad enough as it used to be, has become decidedly worse of recent years. Taking the quantities of free and albumenoid ammonia as indices of

organic, and therefore of dangerous pollution, I have found the following amounts expressed in parts per million :—

	1885-86.	1892.	1893.
Free ammonia	·00	·02	·005
Albumenoid ammonia ...	·15	·20	·21

These figures become more eloquent when I tell you that a very high authority on water analysis says—'Free ammonia being absent or very small, a water should not be condemned unless the albumenoid ammonia reaches something like ·10 parts per million. Albumenoid ammonia above ·10 begins to be a very suspicious sign, and over ·15 it ought to condemn a water absolutely.' Belfast is badly in want of a new water supply, and I rejoice that the Commissioners have decided to push on the Mourne scheme with all haste. The ratepayers ought not to object to an additional tax for the purpose, and I am convinced that they would not do so if they knew how bad the present supply is and what serious risks they run by its consumption. As to the excellence of the Mourne water there can be no question, as I have proved by my own analysis. I am indebted to Mr. Thompson, of Glassdrummond, for collecting the sample of Kilkeel River water, of which I append the following analysis:—Kilkeel River water, 1893; the sample was clear, colourless, and with no sediment. Total solids, 6·4 grains per gallon. Hardness, temporary, 0; permanent, 1; total, 1. Chlorine, 0·8 grains per gallon; ammonia, free, ·00; albumenoid, ·06. It is in fact a water of great organic purity, collected from an area where, I believe, there is no chance of dangerous pollution, and in every way fitted for the wants of a large town like Belfast. Not only is it a splendid drinking water, but owing to its remarkable softness it is pre-eminently suitable for industrial purposes, such as washing and scouring linen and for supplying steam boilers. In connection with the subject of hardness, I have made a calculation which may interest the audience this evening. If we suppose that each individual of the 273,000 inhabitants of Belfast uses one gallon of water daily for washing purposes, then taking the hardness

of the water as 7·5, the total waste of soap amounts daily to 2,925 lb., while with the Mourne water the waste would only be 390 lb. In a year these figures reach the totals 1,067,625 and 142,350 respectively. Further, taking soap as costing 3d. per lb., the annual expenditure of the total population on this commodity amounts, on the above assumption, to £13,340, whereas with the Mourne water the cost will only be £1,779, a saving per annum of £11,561. At this rate the money saved the ratepayers in soap would very soon cover the total outlay for the new scheme. In conclusion, it is my firm belief that the new water supply, coupled with the new drainage scheme, will have a very marked influence in lowering the death rate of the city, which, as everyone present knows, is far too high. and I also think that their influence will be specially felt in checking the amount of typhoid fever which is so prevalent in the town that I believe Belfast now enjoys the very unenviable reputation of being the premier town in the kingdom as regards the amount of this disease."

The only remark I have to make is that I have myself been frequently in those mountains, and have found that the water is very tempting to drink. One is disposed to take a great deal too much water without diluting it with anything else.

Professor EVERETT—I feel much obliged to Mr. Macassey for the remarkably interesting sketch he has given us of a scheme that seems so utterly free from any weak point. I have done my best to find out weak points, but I cannot see any suspicion of one. I think the Commissioners have been very quick about the matter. Quite recently they were discussing whether the best supply would be got from the Mourne district or from Lough Neagh, but they have now got everything cut and dry and carried by Parliament with wonderful completeness. I should like to ask Mr. Macassey how many storage reservoirs there are? (Mr. MACASSEY—One storage and one service; the numbers on the diagram are Parliamentary numbers). As to the quality of the water, anyone who has lived at Newcastle can bear witness that the water there is remarkably

soft for washing and good for drinking, and this site appears to be the very best from which water could be obtained.

Dr. Lindsay—I have only one opinion with regard to the scheme which Mr. Macassey has explained to us in such a lucid manner—that it is the right and natural one. It has, among other merits, the great merit of offering prospective finality. I am only expressing my own private opinion, but I do not think we can consider our present supply more than about third-rate in quality. It is a fairly pleasant water, but it contains a large amount of vegetable matter. If filtering is done it is a moderately good water. The effect upon the health of Belfast with the Mourne scheme will be most beneficial. Our death-rate is certainly 5 per 1,000 too high. We have a great deal too much typhoid, and we have also to face the possibility of cholera coming here. Any precaution taken against cholera would reduce the amount of typhoid and other diseases. I should like Mr. Macassey to mention the time it would take for the carrying out of this work. We heard eight years, but it would be extremely desirable that that time should be shortened if possible.

Mr. John Brown—I have listened with great interest to Mr. Macassey, particularly as I am very well acquainted with the district to be taken in by this scheme. There was one statement made which gave me very great pleasure—namely, that peat was a wholesome addition to the water, in fact, necessary in order to make it wholesome ; because I think I can guarantee from an intimate knowledge of the district there will be a very large amount of peat. I have got a sample here of Mourne water which was taken after six hours' rain in July, 1892, and a second sample taken after the flood had settled a little. This latter is not so visibly black. These are not taken from one of the rivers which the scheme passes round, but from a river about a mile and a half from Annalong. The audience need not congratulate themselves upon that point, because all these rivers are alike, all rise in large peat bogs, which are stirred up as the rain comes down. I gathered from Mr. Macassey that

he anticipated that this peat will settle. I do not know whether he expects it will settle in the reservoirs, or in the conduit, or in the people. My opinion is that peat does not settle rapidly. These rivers run down very rapidly, and what comes down in the shape of clear water is really spring water, filtered through the sandy parts of the mountains, whereas the dirty water is peaty water that comes down direct off the surface. I do not wish to throw any cold water on the scheme ; I merely wish to point these things out for the information of the citizens who have to pay for the work, and I, of course, leave it to the engineers to say what is going to be done with the peat which contaminates I may say, from an approximate calculation, three parts of the water flowing down the mountain rivers in the district from which the new supply is to be taken.

Mr. Conway Scott—I am, and always have been, in favour of the Mourne scheme. Mr. Macassey says adopt the Mourne scheme for one reason, and one reason only—your present supply is too small. Granting that, I say there is another reason, and a more important reason, that your present supply is unsatisfactory (I do not wish to go the length of Professor Letts or Mr. Brown), it is not a good drinking water. I think it is an absolute necessity to get a new water supply, and there is no place where you will get such a supply as at the Mourne mountains. Regarding the objection raised by Mr. Brown, I do not know that you will go anywhere without getting bog, but if the Water Commissioners have purchased out all the ground at low rates, why not spend a few more thousands and cut the bogs out altogether ?

Mr. Francis Curley—I would like, Mr. President, to ask Mr. Macassey, through you, how it is that we have got such an inadequate supply from the Stoneyford scheme ? If there is a large amount lost owing to the construction of the reservoirs ? and if it is a fact that an eminent authority gave very high certificates with regard to the Lough Neagh scheme, which were kept from the public ?

Mr. P. C. Cowan—On the whole, we have a fair working

supply of water in Belfast, and while many important industries have been crippled or paralysed in Dublin on account of scarcity of water during the unusually dry season, I am not aware of any similar experience in Belfast. As regards the quality of the water coming off the Mourne mountains, Mr. Brown has put before you his experience of one river which he admits is not included in Mr. Macassey's scheme. I would ask you to think of another stream in the same region, that which gives the water supply of Newcastle, County Down. I have never drunk better water, and I believe its excellence is well known to many of you. Is it not far more reasonable to expect, with a knowledge of the good quality of the Newcastle water, that the proposed new Belfast supply will be excellent than to take Mr. Brown's sample from a stream not included in the scheme as representative? It is well known that in every large scheme provision must be made to get rid of some unsuitable water, and I doubt not this will be attended to in the new works. It so happened that recently I had to take part in a committee room in the House of Commons in an opposition to some detail points of the Bill for the Mourne Water Supply, and I can assure you I was much impressed with the care and ability with which the interests of the citizens of Belfast are attended to by the Water Commissioners and by their secretary and engineer.

Professor FitzGerald—I think a great deal too much stress has been laid upon the bog stain in the water, which is only evidence that the water has been in bog, and does not prove that there is any harm in the water. I believe, as Mr. Scott said, it would be almost impossible to find a place absolutely free from bog and where you would not be able at some time to collect numerous specimens of water such as Mr. Brown produced. It occurred to me that if sandy soil will clear water so as to take out the bog stain, there is no obvious reason why it should not be done in this case, where you have got an opportunity of passing it through large quantities of gravel afterwards, there being no restriction in the amount of natural gravel beds that could be taken outside the storage reservoirs.

Mr. Greenhill—I inferred from Mr. Macassey's remarks that he estimates that the present arrangement will provide for a double population of Belfast. I think if manufacturers increase their works as they have been doing in the past, it will require a very much larger quantity of water than double, assuming that the population of Belfast increases to twice the present number. Many wells in Belfast have become practically dry, and those who have adopted the Commissioners' water will not regret it. I had several cases under my immediate observation where the greatest possible advantage arose through taking the water from the Commissioners rather than from wells. With regard to the steel pipes, I would ask Mr. Macassey whether it would not be safer, instead of bringing the water in a large pipe, under an enormous pressure of perhaps 150 to 200 lbs. to the square inch, to bring it in sections, because if an accident occurred it would in all probability cut off the supply until the pipe was repaired. Would it not be therefore wiser, from a mechanical point of view, to use a number of small pipes side by side?

Mr. Macassey—As regards the steel pipes which have been referred to, there is no doubt that chances of failure to the pipes would be reduced by having a number of small pipes. The objection is the matter of expense. It comes to be a matter of policy whether we save £10,000 and run the risk of a loss of £100 a year, or whether we shall spend £10,000 and not run the risk I have mentioned. It is proposed that at the risky places the pipes should be duplicate, so that in the case of a failure we could turn the supply and send it on. As I mentioned in connection with the service reservoir, we reckon on the possibility of having a failure which may take a week to repair and be able to keep up the supply. As regards the Stoneyford scheme, it was framed to give about 3 or 3½ million gallons a day, and it has given that by actual experience. There is no loss of water at Stoneyford. I think that what has given rise to the point is the fact that the Commissioners are bound to send down compensation water to the millowners.

The Commissioners in making up that compensation water are entitled to take credit for the flow of water off the lower district. That is the only loss of water, if you can call it so. The idea that the scheme has failed is an erroneous one, and I am very glad to have the opportunity of stating so here. Lough Neagh has also been brought into the discussion. It was suggested—in fact, stated—that some certificates had been obtained with respect to the quality of the Lough Neagh water (I presume this meant by the Water Commissioners), and that these had been suppressed. As I am fully conversant with everything that took place I am able to give a direct and emphatic contradiction to that statement. The Water Commissioners never suppressed any document which came into their possession. They took the opinion of the most eminent authority on water questions (Professor Dewar), and he advised them not to get the Lough Neagh water. Mr. Robert Corry is quite right in his criticisms of my observations with regard to the construction of the pipe part of the conduit. I did omit to state that in the construction of the tunnel part, or of the "cut and cover" part, it would be a serious matter if in 25 or 30 years we had to make a new conduit, that is, on the assumption that we made the first one merely sufficient for the ten million gallons. It would therefore be better to make the work fully satisfactory at once. I come to the question of quality, and I feel myself in a very considerable difficulty, but I think the audience will be inclined to say that the weight of the evidence is rather in favour of the view that the Mourne water is of good quality. Professor James Dewar, F.R.S., is a man of immense experience, who has gone over the ground, not alone in fine weather, but in a heavy snowstorm. He says, on looking at the district, "You will get a good quality of water there, suitable for domestic purposes," and he further says, that the catchment is one of the best he has ever known. I ask the audience, then, to weigh the evidence. We have Mr. Gray, who knows a good deal about this district, plus Professor Letts, and we have Professor Dewar, one of the highest

authorities on the subject, whose opinion before a Parliamentary Committee on the question of the quality of water would pass a Bill or throw it out. And on the other hand, what have we? We have Mr. Brown's bottles of black water, taken from a river with which the Commissioners do not propose to interfere. Some time ago a gentleman wrote a letter to the *Northern Whig* calling attention to the fact that some of this water was very boggy, and he sent a bottle to the office of the newspaper, inviting inspection. Well, I was informed by a friend who went to see this bottle about three days after it had been deposited that it afforded a remarkable proof of the fact I described to-night. He found that a lot of black stuff in it had settled in the bottle, and the remaining water was as pure as anyone could wish for. I think Mr. Brown was the gentleman who sent the water. As to Professor Letts's communication about the quality of the Belfast water, no doubt the present supply from Stoneyford or Woodburn does not come from an area or areas equal in character to that in the Mourne district, but they will compare with many of the areas in operation in different places in England and Scotland, and you may look for a very fair quality of water. At the present time our water is nearly all filtered, but the works are not complete. Looking at the water which comes out of the filters it is bright and pleasant, and if the consumers got their pipes and cisterns well cleaned out there would, I am sure, be no complaint. Dr. Lindsay made an observation with regard to the influence of the water supply on typhoid fever. I cannot say whether he is wright or wrong in the conclusion he drew. Until the present it was admitted that the quality of water in Dublin was of a very high class, yet is it not a fact that Dublin headed the list in typhoid fever? I must conclude now by thanking the ladies and gentlemen present who have taken such a very strong interest in the details which I have had to submit to them.

5th December, 1893.

Professor FitzGerald, B.A., M.I.C.E., in the Chair.

Mr. W. H. Patterson, M.R.I.A., read a very interesting Paper on

THE ANCIENT SHELL MOUNDS AT ROSAPENNA, COUNTY DONEGAL.

The Lecturer illustrated his remarks by a numerous collection of "finds," which he presented to the Museum. The "finds" were diverse in their character, and their association with the early inhabitants of this district was very evident. For the most part they were fossilised remains of animals, which, according to Mr. Patterson, had enjoyed life about the 9th or 10th centuries.

Mr. Wm. Gray, M.R.I.A., said that Mr. Patterson's paper referred to phenomena well known round the country, and were associated with sand dunes, he might say, wherever to be found. He agreed with Mr. Patterson that the remains belonged to the 9th or 10th centuries, and clearly did not belong to the period three or four hundred years before Christ, such as the remains found at Ballintoy and Dundrum.

Report of Mr. A. Tate, C.E.,

Delegate from Belfast Natural History and Philosophical Society to Meeting of British Association at Nottingham, 1893, *on the Conference of Delegates of the Corresponding Societies at that Meeting.*

As the Delegate from your Society to the Corresponding Society's Committee of the British Association, at its last

meeting, held in Nottingham, I have been requested by your Secretary to give you some information in regard thereto.

In the opening remarks of the Chairman of this Conference, Dr. Garson, reference was made to what he considered an inadequate appreciation by the Societies of the privileges and advantages of joining in these Conferences. Among these he specially mentioned the great advantage it was to the workers in the various Societies to have the titles of their papers printed and published in the annual reports of the British Association. He also mentioned that the transactions of the various Corresponding Societies were bound and kept available for reference in the library of the British Association at Burlington House. But, surely, the claim for advantage should not be deemed to end with the benefit to the authors of these papers, but might be shared by all the members of the different Societies, and an even larger public outside them. To give some idea of what this possible benefit means—a reference to the list of papers in but a single volume of the British Association reports, that of the Edinburgh meeting, the latest published—I find that in it are included the titles, authors' names, &c., of about 500 papers, and these classified under the different sections of the Association from A to H.

Supposing that a member of our or any other of the allied Societies desired information in regard to any subject, at the time of special interest to this member, a reference to these lists in some of the back volumes of the British Association reports would, not improbably, open up to him or her a means of obtaining what was desired, or some help towards it. Attendance at Burlington House would not be indispensable. An application to the Secretary of the Society would, no doubt, at once receive a favourable response.

The Conferences commenced to be held in 1886. The number of Societies now in correspondence is 86. Belfast for many years has had this Society and the Belfast Naturalists' Field Club joining in the good work and sending delegates to represent them.

In section A, Mr. Symons, Chairman of the Committee in connection with Meteorological Photography, stated that they had received, in all, 467 photographs of clouds, and that the Committee did not press for more. They intended to select the typical ones and have them brought to a uniform scale in order to promote their general utility. In the Committee's report the study of the changes in the high level clouds is mentioned as the only branch needing further elucidation, and as this was a work of considerable difficulty, requiring special skill, appliances, and much leisure, it would be specially provided for. Very high commendation has, however, been given to the photographs of this class furnished by an Irish gentleman, Mr. Greenwood Pim, of Dublin, whose further offer of aid has gladly been accepted.

The great want felt was for an efficient atlas of the higher clouds. The Committee sought for power to arrange for the publication of a provisional atlas as a commencement. The available funds, however, at the Nottingham meeting appear not to have sufficed to permit of an enlarged grant to this Committee.

There is still a need for further photographs of lightning The report affords a full explanation of what has been done in this direction, and the best method to be adopted.

In section C the representative of the Geological Photography Committee stated that they were publishing their fourth report this year. They had received 40 new photographs, making the total collection 846, and their appeal had been more successful than in any previous year, but there was still much to be done, and he hoped the Delegates would stir up their Societies on this point. As to the best camera, the most portable was to be preferred. Many photographs had been sent in without the name of the Society, of the photographer, or of the place photographed. It had been decided not to lend any more photographs to the Societies unless duplicates were furnished. The Committee are ready to receive any good photographs, irrespective of size. It was a satisfaction to know that in the

collection several of our Belfast members had rendered good aid, and I noticed with pleasure this year some admirable enlargements from negatives made by one of our lady members. Mr. William Gray, who is a member of this Committee, will, I am sure, be glad to give any needed information and to take charge of and forward any photographs entrusted to him.

The Erratic Blocks Committee, although in existence for 21 years, still finds many gaps in the information supplied to them, and complaint is made that from many districts no reports whatever have been received. I fear we cannot claim to have done much to aid this inquiry, and yet a good field for observation and report was open before us. I hope that those of our members (and there are several) who have the requisite opportunity and skill will not lose sight of this work in the near future.

In section D the subjects of the protection of wild birds' eggs and the disappearance of native plants received attention. Among the novel suggestions made, specially in reference to the first subject, was to utilise for this object the teaching of the young in Board and other schools. As regarded the latter, it was reported that the wild maiden-hair fern had been found near Morecambe Bay.

In connection with the question of Museums, the possibility and desirability of having support given to local Museums through the Technical Instruction Acts was suggested, and the suggestion favourably received. The reading of papers on the contents of these local Museums, in their separate departments, was recommended by the chairman, with a view to their being catalogued in the Association lists, and thus brought under the notice of workers in the same subject elsewhere. This would be specially desirable where, as is often the case, the local Museum is rich in the materials *peculiar* to its neighbourhood.

In section F reference was made to the Ordnance Survey maps and to the insertion therein of matters of archæological interest. As there is a new survey of this district at present in

progress those of our members who are experts in this subject will, I doubt not, be glad to take advantage of the opportunity to have all omissions within their knowledge supplied.

In section H the principal subject was the Ethnographical Survey of the United Kingdom. The Chairman of the Conference, who was also a member of this Committee, in especially drawing the attention of the Delegates to its work and the first report, just issued, hoped they would bring it before their respective Societies ; as the kind of work required is essentially local and such as would give greater scope for investigation to the members of their Societies the intention of the Committee is shortly stated in the report as follows :—

"The Committee propose to record for certain typical villages, parishes, or places, and their vicinity—

(1) Physical types of the inhabitants ;
(2) Current traditions and beliefs ;
(3) Peculiarities of dialect ;
(4) Monuments and other remains of ancient culture ;
(5) Historical evidence as to continuity of race."

As a first step, the Committee desire to form a list of such places in the United Kingdom as appear especially to deserve ethnographic study, out of which a selection may afterwards be made for the Survey. The places which appear to them most suitable for entry on the list are such as contain not less than 100 adults, the large majority of whose forefathers have lived there so far back as can be traced, and of whom the desired physical measurements, with photographs, might be obtained.

The entire report, which occupies over 33 pages of close type, shows the energy and success with which the preliminary work has been prosecuted. Already a list of upwards of 250 places in England and Scotland considered suitable for such survey has been made. As regards Ireland, it is stated the matter will be investigated by a sub-committee, under the auspices of the Royal Irish Academy, of which Committee Professor Haddon is the Secretary. From this sub-committee

no report of progress is recorded. But as the announcement of the formation of the Committee, made last year at a meeting of the Belfast Naturalists' Field Club, was very warmly received, I have no doubt this neighbourhood will not be neglectful of the aid which it is so well fitted to afford. The mingling of races from varied sources which, from time to time, has occurred in this part of the country has left indications still existent which may well be sought out and recorded. The same may be said of many other parts of this island, and I doubt not, under the auspices already mentioned, will not be lost sight of. As evidence in this direction, I may mention that at the last meeting of the Royal Irish Academy a paper was read by Dr. Charles R. Browne on the Ethnography of Inisbofin and Inishark, Co. Galway, and has been referred to its Council for publication. The attention given to the subject of "Folk Lore" at the last meeting of the Belfast Naturalists' Field Club also shows that some of its members are on the alert in, at any rate, one branch of the subject. It will, however, readily be seen how much remains to be done, and I would hope that a systematic effort may be made by both the Societies, Belfast either acting conjointly or not in its own sphere, to have adequate returns sent forward from this district.

Among the many subjects upon which papers were read during the Association's meetings likely to be of special interest to the members of this Society, time will only permit me to refer to one or two.

The presentation of the report of a Committee on the Marine Zoology of the Irish Sea showed that important results had been obtained from the district investigated—viz., that which could be readily reached from the Isle of Man—many new species had been obtained. This Committee will continue their work under a new grant.

In the Anthropological Section a very interesting communication was made in regard to explorations of an extensive lake village at Glastonbury. The work appeared to have been done in a very careful and systematic manner. Among the results

there was an extensive exhibition, in cases, of the relics of the former inhabitants. This work also will be continued under a renewed grant.

I cannot close these discursive remarks without at least a simple reference to the announcement which to-day reached us of the death of that eminent man of science who, when the British Association last met here, was its President—Professor Tyndall. It would ill become me, so little fitted as I am to the task, to enlarge upon his manifold claims to regard, respect, and admiration. This will no doubt be fittingly done by many qualified to do it. I shall only add that in him Ireland has lost one of its conspicuous lights.

Professor FitzGerald—With reference to Mr. Tate's report, I do not know whether the members of this Society have had their attention directed to some recent publications on the subject of the glacial epoch. A great deal of information is contained in an article on the subject in the last *Quarterlv Review*. With reference to the allusion to Museums, I see that the Chief Secretary has consented to receive a deputation on the 15th inst., with the object of urging upon him the importance of making better provision for technical education in Ireland and establishing a separate department for science and art in this country.

Mr. Wm. Gray alluded to the admirable photographs sent in from Belfast in connection with the geological section of the British Association. Belfast was the first to co-operate with the Association, and near the first to send forward ladies' work. They had reason to be proud of the position they occupied.

Mr. Douglas Lithgow read a Paper on

GOSSIPINGS ABOUT THE PARISH OF SAUL.

Some time ago I intimated to my friend, Mr. Young, that it was my intention to present to the Belfast Museum two old

fragments of stone, which I picked up a few years ago in the Parish of Saul, County Down. I have brought them here with me this evening for your acceptance, and shall feel amply rewarded if you will do me the honour to find them a resting-place in this home of security. I am afraid I cannot trust myself to give an accurate description of them, but feel confident that any technical omission on my part will be fully compensated for by the minute inspection to which they will be subjected to at your hands. Before proceeding further, however, I would humbly claim your kind indulgence to say a few words relative to the early history of this ancient parish and the surrounding district, with which I have been familiar since my childhood. I shall, therefore, ask you to bear with me for a short time, while I endeavour to put before you the few facts which I have hurriedly arranged in the most condensed form, merely to serve as a brief historical outline of a division of the country teeming with research and full of antiquarian lore. Leaving Downpatrick, the representative city of the once famous kingdom of Ulidia, and proceeding in a north-easterly direction for a distance of about one and a half miles, along one of the most charming roads in Ireland, we arrive at Saul; and taking our stand on the little green patch in the centre of the spot where the three roads converge, and looking steadily around on every hand, upon the beauty and magnificence of the scene which presents itself to our view, we can reasonably account for the intense love and veneration cherished by our patron saint for a land so fair and a scene so rare. It may be a source of disappointment to many to find historians differing as they do regarding the place where St. Patrick first set foot on Irish soil. It is a question which has never given rise to any degree of doubt in my mind, since I have closely followed up the line laid down so carefully by Dr. Lanigan (author of the Ecclesiastical History of Ireland), who was fully satisfied regarding Lough Cuan (now known as Strangford) as the place where the saint landed. The late Mr. J. W. Hanna, whose knowledge of Irish history was unsurpassed, and whom I had

the privilege to accompany, times out of number, on little excursions through the bye-ways and lanes of Lecale, published a pamphlet many years ago, from which I cull the following :—"The several lives of the Saint published by Colgan (in each of which the facts concerned are much the same), assert that St. Patrick having proceeded northwards, along the coasts of Dublin and Louth, and passing by the kingdom of the Ultones (formerly Ulidia, now the barony of Lecale), at length penetrated into a certain frith, which is Brénnèse, and he landed at Ostium Slain (the mouth of the slain). There, indeed, they concealed the bark, and they came a little distance into the country, that they might rest there and lie down." Here we are called upon to solve the great problem of identification of Brénnèse and of the Slain, and to set aside the opinions of the majority of those writers who have been in favour of Dundrum Bay, and who seem to have followed the popular belief of those who preceded them, rather than afford us sufficient evidence to prove that they had made a full examination of the facts for themselves. I think if we closely consult the Book of Armagh, compiled about A.D. 807 ; The Life of St. Patrick, published by Colgan ; Harris's History of the County Down, Dr. O'Donovan, Dr. Lanigan, and other writers, we are enabled to arrive at the conclusion that the Fretum Brenesse could be interpreted in no other sense than the present Lough of Strangford. The "Four Masters" write :—"An inundation of the sea over the land at Brena, in this year, which was the seventh lake eruption that occurred in the time of Partholon ; and this is named Lough Cuan." Now, Dr. O'Donovan observes, "This is called Fretum-Brennese, in the second and fourth lives of St. Patrick by Colgan." To my mind the evidence is sufficiently clear that it was the ancient name of the mouth of Strangford Lough, and, that after the inundation, the lake thus formed was called Loch Cuan, now known as Strangford Lough. I will again take the liberty of quoting from Mr. Hanna's notes :—"Sailing down Strangford River, passing Audleys and Walshestown Castles, and steering in a westerly

direction, between Saul and Gore's Island, in a pretty little recess or estuary, you come to the mouth of a small river, having the high foreland of Ringbane (Rin-Ban, the white promontory) to the east, and Ballintougher (Bailean-tochair, the town of the causeway) to the west, which townland forms the extreme land boundary of Strangford Lough. This river rises in Loughmoney, about two miles to the South, and was formerly a tidal river, for upwards of a mile, nigh to the little village of Raholp. Ballintougher was a Government port, included in the Ardglass collection, in the time of Elizabeth, and of James the First. Latterly a battery and flood-gates have been erected at its mouth, for the purpose of keeping out the tide and reclaiming the broad expanse of land at the embouchure. In the taxation of Pope Nicholas, made in 1306, under the deanery of "Lechayll" in the diocese of Down, we find between the church of "Knockengarre," now Walshestown, and the church of Saul—the church of "Balibren." The late Dr. Reeves, in his "antiquities," has been fully able to identify the church with Ballintougher, previously mentioned, on the authority of an inquisition 3, Edward VI., which found Balibren, *alias* Ballintougher, as being of the annual value of £9 7s 2d, and, as then, appropriated to the Cistercian nunnery of Down. No reasonable doubt can exist that the name Brennese is the Latinised form of Brena, entering into the composition of the name Balibren, instances of which frequently occur in the taxation—nor can there be any doubt that the land of Brena, stated to have been overflowed, and the Ballybren of the taxation were identical, and imparted the name to the "Fretum Brénnèse." The river Slainge, or Slan, the mouth of which lies between Ballintougher or Ringbane, has from the earliest times been called the Slaney River. There is no difficulty whatever in tracing it out. It wends its way like a silvery streak from its original source to-day as it did centuries ago. This river can be no other than the Slain, referred to in the "Book of Armagh," at the end of the Brena. It is only one and a half miles from the church at Saul, and, to those who

have investigated for themselves the facts connected with the history of this district, I think there can be little difficulty in arriving at the conclusion that, from the time the saint left the boat, and penetrated into the thick wooded country, to the time of his meeting with the native Irish Chief Dichu, the journey between the place of his landing at the mouth of the Slain and the place of meeting Dichu, fully correspond with every narrative history records on the subject. I will not attempt to tax your patience by reciting what actually took place at the meeting of St. Patrick and Dichu on the sloping hillside at Saul. The spirit of Divine power and love was surely there. The swords and spears of Dichu and his warriors were soon turned into ploughshares and pruning hooks. The light and love of a Divine Spirit had touched our benighted land; henceforth, all things became changed and transformed. "The wilderness and solitary place was made glad," and when the saint had fulfilled his holy mission throughout the length and breadth of this island, he returned, weary and foot-sore, to Saul, the place he dearly loved, the spot from whence he originally started on his great work, and there he fell asleep in death, and on the 17th of March, A.D. 493, was buried at Downpatrick. Dichu either built by direction of the Saint, or it may be that a building of some kind existed at Saul in the form of a barn, and this the chieftain, after his conversion, gave to St. Patrick. In course of time a church was built by the saint, and placed from North to South. In Harris's History of Down, this church is referred to as "a monastery for canons regular—the first Abbot appointed by the Saint being St. Dunnius. The modern pronunciation of Sabhall is Saul, and the latter Latinised is Saballum, and in the Irish language Sabhall or Savhall Phadrig, signifying "the barn of Patrick." A short distance from Saul, at a little village called Raholp (Rathcolpa), is the church of St. Thassach, the ruins of which are there to this day, having withstood the ravages of time's destroying hand for so many centuries. There it stands in all its loneliness, and is, without exception, the most perfect type of the building of the fifth

century in Ulster. St. Thassach was the chosen disciple of St. Patrick, the first bishop of Saul, who gave "the body of Christ" to St. Patrick, before his death, in the monastery of Saul. The little church of Tassach is about 32 feet long, 20 wide, and stood about 12 feet high. The wall to the south has fallen, and the window in the east end is crumbling to pieces, through want of a stitch in time. The windows are splayed with flat stone lintels, and the material used for bedding the stones is a kind of rough yellow sandy clay. I am inclined to think that some valuable discoveries might be made here, for on tapping the large flat stones, which form a complete fence or enclosure round the foundations, they emitted hollow sounds, as if from a chamber below. It may be of interest to state that the large altar stone, measuring about 12 feet long, 4 feet wide, and in some places almost 8 inches thick, at present in use in the Roman Catholic chapel at Saul, was originally used for the same holy purpose in the ancient church of the parish. Scattered throughout the district may be seen many valuable relics of the past, far too numerous for me to refer to in this short paper. There is a very fine pillar-stone standing in a field at Raholp, with a trace of Ogham characters, and on the face of a large rock, a few paces from the road, on the crest of the hill leading down to the village, may be seen a considerable number of Ogham characters, which, I need scarcely tell you, I never attempted to decipher. We have no reliable information afforded us of what took place in the Abbey of Saul between the fifth and eleventh century, and in order to hurry along I have purposely avoided entering into the ecclesiastical history of Down and Saul. About 1174, a son of the Abbot of Moville, in the "County of Ards," was Abbot of Saul, and a subscribing witness to the charter granted to the abbey of Downpatrick by Sir John De Courcey. In passing I may here mention that Downpatrick is the chief town of Downshire, the only county in Ireland designated a shire, and represents the greater portion of the ancient kingdom of Ulidia. Like many other ancient royal cities it has been subjected to changes,

which seem to have been a common custom in the middle ages. Thus Down is called Dun-leith-glaisse, Drum-leith-glaisse, Dun-da-leith-glaisse, Aras-Keltair, Rath-keltair, Mic-Duach; the fortification of Keltair, the son of Duach, the former name Doun, from Dun, a rath or fort, and finally Downpatrick. It was on this rath or mound, which is one of the largest and most perfect in Ireland, that the native princes of the district were crowned. Mr. Hanna informed me that King Keltair, of the battles, was buried in the centre of this mound, and the large stone cross which was erected over his grave was removed by De Courcey, who set it up in the centre of the town to mark off the English, Irish, and Scotch quarters. The base I discovered in the yard of Denvir's hotel, under the pump. It is at present used as a watering-trough; the shaft is in the possession of the Rev. Father O'Kane, and may be seen any time at the Roman Catholic Cathedral Church. The head is carefully preserved by Mr. W. N. Wallace. There are large portions of the stone cross which marked the grave of St. Patrick to be seen at the old cathedral, the base of which is also used as a watering-trough. In 1526 the Abbey of Saul, with two castles, a garden within the site thereof, and three carucates in Saul and Meritowne (Ballysugah) were granted to Gerald, Earl of Kildare. In 1770 the Protestant church of the parish was erected on the site of the old abbey. There still remains one small vaulted chamber, with a square window and doorway, and a portion of one of the gables about 2 feet thick. Some time about 1870, when extensive excavations were being made for the erection of a large vault, a number of graves were discovered, lined with flagstones, and each containing a number of small white pebbles, similar to those often found in ancient Irish graves. I remember a few years ago, while a farmer named John Fitzsimons was engaged breaking up the field adjoining the graveyard, he unearthed a number of beautifully carved stones, but on my return to the place the following day they had mysteriously disappeared. The late Mr. Samuel Hastings, of Downpatrick, had two well-preserved stone pillar bases,

which he found when making excavations. He pointed out to me on one occasion a mark in the field next the old road, where there was a vaulted chamber still remaining, in a perfect state of preservation, flagged, and a groined roof. There is a well carved stone to be seen, built into the wall at the entrance gate. It is the cover lid of a sarcophagus, ornamented on the edges with a well-defined key, in relief, carved on the face. In the chapter house, Westminster, there is a petition, with the seal of the Abbey of Saul attached. On the seal is inscribed—"S, commune capituli sancti, Patricii de Saballo." The abbot is vested as a priest, sits in a rich chair, holding a cross in his left hand, and raises his right hand, as in the act of giving benediction. The lower compartment of the seal exhibits a bishop holding a crozier. There is a brass seal in the Belfast Museum bearing the following inscription:—"S. Fratris Johannis, Abbatis de Saballo." The two old castles before referred to have long since been demolished, and no trace of them remaining. I will try, however, to localise them. The River Coil—Coile—Quoile—signifies narrow, wooded river, and is derived from the word Cill—Kyle (the Kyles of Bute, &c.). It has, at an Anglo-Norman period, been adorned with no less than twenty-six castles. The townland of Quoile formerly comprised four denominations, viz.:—Cairne-na-grane (the sun's heap), Ferry Quarter, Castle Quarter, and Mill Quarter. Cairne-na-grane still claims its original name and position. The second castle stood on the late Mr Patrick Henvey's farm, at the side of the timber pond; the third on Castle Hill; Ballyhasson (the hill of the cave), Mr. John West's old farm; and the fourth on Mill Hill, at Lower Saul. De Alton's Castle, which is the name of Quoile Castle, is still standing. It was last occupied by members of the West family. At a place called Struell (Strohill, the land of the streamlet) in the taxation of 1306, about half-a-mile from Saul, are the holy wells of St. Patrick. It has been the custom from time immemorial for hundreds of pilgrims to resort to the wells, in order to perform some religious duty and restore their health by bathing

in the waters. The surroundings of Saul will bear favourable comparison with any scenery in the North of Ireland. There you have wood and water, mountain peaks, and lovely valleys, stretching far away in the distance, till we can clearly define upon the horizon the stately towers of Scrabo, Helen's of Bangor, Slieve-Croob, and the Mourne Range. Over against the north-east corner, bordering on the lake shore, stands the high embattled tower of Myra Castle, frowning down upon the peninsula of the Ards, like a mighty sentinel as in days of yore, keeping watch and ward over the most fertile and highly cultivated tract of country in the world. Saul seems to have been the centre of a great ecclesiastical district, even at the time of the Druids. I am led to form this conclusion in consequence of the abundant evidence which the district presents. I find that Slieve-na-griddle (Slieve-gridiron), "Mountain peak of the sun," which is crowned with a large flat stone, is in direct line, or rather at right angles, with Slieve Donard and Slieve Croob; so, to complete the figure, we have Slieve-gridian in the east, Slieve Donard in the south, and Slieve-Croob in the west. There is a most perfect Druidical temple close to the ancient abbey of Erinagh, or Carnig, in a field at (Laig-na-madda) Ligamaddy (the dog's hollow). The above-named abbey, as you will remember, was demolished by De Courcey, who atoned for his crime by building the abbey of Inch (Inis Courcey), the island church of Courcey, formerly called Iniscumscraidh. He translated all the property of the former to the latter—the three circles—those on the outside for the bards, the second for the priests, and the third for the Archdruids, can be distinctly seen, together with the guard stones, or "bowing stones," in the fields around the temple. I counted forty-eight stones as belonging to it. There is a second temple near at hand on the farm of Mr. Cleland, Ballyalton ("the little cliff"), besides innumerable items of interest, which I must pass over. At Slieve-Croob ("the hill of the cairns") are twelve cairns, upon which the Archdruids stood when proclaiming the "Brehon," or unwritten law of Ireland. In more modern times Down-

patrick and Saul seem to have had a controlling influence over the great district they commanded, as the whole country is studded over with monasteries; the only two of which any trace remains being those of Inch and Greyabbey. The two old fragments of stone, which I have had great pleasure in handing over to the Belfast Museum, belong to an early age; I should say the tenth or twelfth century. The larger of the two is covered with carving (in relief) on either side. On what appears to be the face of the stone, is a cross and crucifix; on the opposite side, a bishop's key, crosier and mitre. It is about six inches thick, and is carved with fine fluted lines over slightly rounded off corners. Along the top are three half-moon sockets, about 1½ inch deep, which evidently have been intended to fit down upon studs of another slab. The smaller stone has been used for holding the blessed water. You will observe two small lips have been cut on the top edge or rim, for pouring off the contents. On turning this stone upon its face, it presents the form of a cross; hence I am led to believe that the larger stone has formed the top of an ancient Irish cross, erected at an early period in the history of Saul, to mark the sacred spot wherein may have been deposited the remains of some great dignitary of the early Christian church. Here I must humbly apologise for having occupied your time this evening at such length with this hurriedly written gossip about the ancient Parish of Sanl.

Mr. W. H. Patterson—The district that has just been referred to is exceedingly rich in antiquarian remains. As regards the two stones Mr. Lithgow has presented, the bowl-shaped one, as he says, is probably a holy water basin, the grooves at the side being made that it might not be filled too full. The other stone seems to be a portion of a raised cross which never had any arms, but the edges of which were decorated with the figures of ecclesiastics. On one face there is a beautiful sculptured cross and on the other a figure of the crucifixion. These stones may probably be referred to the 13th century.

The concluding business of the meeting was of a most entertaining nature, Miss Susan Richardson giving an exhibition of the latest improved phonograph brought from U.S.A. by Mr. Alex. Richardson, Lambeg. With Miss Richardson's clever and skilful manipulation, assisted by her brother, the phonograph delighted the audience with selections by brass and string bands, comic songs, and negro sketches, and so distinct was the reproduction, and so clear the intonation, that the improvements which have been effected in the instrument, the most marvellous example of the genius of the century, were palpably evident.

Professor FitzGerald—I certainly wish to express the thanks of this meeting to Mr. and Miss Richardson for their kindness in coming to-night to give us an exhibition of the phonograph. Some considerable time ago we had a somewhat similar exhibition of an instrument, which was of a very much less perfect description than this. The phonograph has been very much improved of late, and you will agree with me that the one we have listened to to-night is very perfect in its articulation. I may anticipate any formal vote of the meeting by expressing our indebtedness to Mr. and Miss Richardson for the trouble they have taken.

19*th December*, 1893.

PROFESSOR REDFERN, in the unavoidable absence of the President (Professor FitzGerald), in the Chair.

MR. WM. MACWHIRTER, M.I.E.E., M. Phil. Inst., Glasgow, gave a Lecture on

MODERN ELECTRICAL INVENTIONS.

MR. MACWHIRTER, who was received with applause, commenced by saying that, as doubtless the theory and practice of electric lighting had been frequently before them, he did not intend to take up time in dealing with that subject, but would draw their attention to other applications of electricity not so generally known. Looking first at the great question of the electric transmission of power, they found that, although the earliest practical example was not twenty years old, they had now in regular use plant requiring many thousands of horse-power, and at the present time there was a scheme in progress for utilising a portion of the power available in the Falls of Niagara to the extent of about 100,000 horse-power. A first instalment of 15,000 horse-power was in fact being pushed forward with all speed, the working pressure of which was to be 20,000 volts and each turbine to develop 5,000 horse-power. The lecturer then gave a brief history of electric traction, describing the conduit system used at Blackpool, the accumulator system in use at Birmingham, the trollery or overhead system employed so extensively in America, and at Leeds and Walsall, in England, the Lineff system which has been more recently placed on trial at Chiswick, and is so far well spoken of, and the electric rail system as used on the Portrush and the Newry and Bessbrook lines. Having given some figures showing the remarkable manner in which the cost of electric traction

has been gradually reduced and is still getting lower in places where it has been adopted on modern principles, the lecturer proceeded to say that electric haulage was by no means confined to tramways, as there was a large field for its employment in the mining industry. He gave several examples of its successful use in Scotch coal mines, and added that the system was being taken up in several of the English collieries. Electric pumping for mines and other purposes was next explained, and a very complete triple pump in work was shown. The process of drilling by electricity formed the subject of the next explanation and demonstration. An electric drill an inch in diameter being set to work, perforated a steel plate an inch thick in about eighty seconds. The lecturer stated that these drills were being now regularly used in all the Government dockyards, and also by the French and Italian naval departments. All the armour plates on H.M.S. Gibraltar, built by Napier Bros., were drilled by one of these machines. They had been made to drill holes three inches in diameter. Many of those present who had visited the exhibitions in London and Glasgow must have noticed the new process of welding. The system mostly known was the Thomson, where an alternating current of two hundred or three hundred volts is transformed down to a pressure of one or two volts, and capable of giving out currents often exceeding 100,000 amperes. The work capable of being done by this system was, however, limited in extent, as it required 50,000 amperes to weld a steel bar 1·5 in. diameter, and for a bar of copper 0·5 in. in diameter 25,000 amperes would be wanted. The weld was made by clamping the bars to be joined in place, and then bringing them together, when they at once commenced to glow at the points of contact, and the heat increased until the metal fused, when the clamps were made to approach each other by means of a screw until the pressure caused the weld to swell to a diameter larger than the surrounding parts, when the article was removed and dressed by the hammer on an anvil. The Bernardos system was far more capable of general application—in fact could be used in

either the repair of a gold stud or a cast iron fly wheel weighing five tons. The lecturer quoted several cases in which very massive articles had been welded successfully by this system, and gave a practical demonstration of the process in welding together two small iron plates. He added that a number of samples of work executed by this system had been sent on by Messrs. Lloyd & Lloyd, of Birmingham, to be used at the lecture, but unfortunately they had not yet arrived. He suggested that when they did come they might be deposited for a few days in the Museum. The concluding portion of the lecture was devoted to an explanation and demonstration of electric cooking. The advantages of the process were absence from smoke, dirt, smell, or unnecessary heat. With the assistance of Mr. John Brown a number of chops, pancakes, &c., were cooked and submitted to the critical inspection of the audience. In conclusion, Mr. MacWhirter tendered his thanks to Mr. H. Robb, who had kindly given the use of his gas engine; to Messrs. W. Ewart & Son, who had offered every assistance; to Messrs. J. S. Brown & Sons, who had given a very large amount of aid from their premises—and particularly to Mr. John Brown, who had contributed so materially to the success of the meeting; to Mr. J. H. Greenhill, who had helped them materially in the work of preparation; to the General Electric Company, who had kindly supplied the very complete and elaborate cooking apparatus; to the Faraday Electric Company, who supplied the dynamo, drill, and other appliances; and to Messrs. Lloyd & Lloyd, for the samples of welded work to which he had referred.

Mr. George Andrews, in proposing a vote of thanks to the lecturer, said he was quite sure all present would join in thanking the gentlemen mentioned by Mr. MacWhirter, although the very fine display of electrical appliances supplied by their kindness would have been of comparatively little use without the lucid explanation of the talented lecturer to whom they had listened with such sincere pleasure.

Mr. S. F. Milligan, M.R.I.A., seconded the motion, which was passed by acclamation.

On the motion of Mr. Gray, M.R.I.A., a similar vote was accorded to the Chairman.

The lecture was largely demonstrative, and many interesting experiments were performed in the mechanical application of electric force. A formidable array of electric appliances occupied the platform, including electric pumps, drills, welding machines, cooking, laundry, and lighting apparatus, &c. There was also a large screen upon which diagrams and pictures, illustrative of the lecture, were shown by the hydro-carbon light, admirably manipulated by Mr. John Brown.

3rd January, 1894.

Professor FITZGERALD, B.A., M.I.C.E., President, in the Chair.

Mr. CONWAY SCOTT, C.E., Executive Sanitary Officer for the City, delivered a Lecture on

"NATIONAL HEALTH."

Mr. SCOTT prefaced his lecture by stating that he had chosen for the title of his address "National Health" in preference to the common expression "Public Health," which in these days of statistics had come to have a very peculiar meaning, differing very much from what the words actually expressed, and he used the term health in its widest significance, including not only physical, but intellectual and spiritual health. By national health he simply meant the state of health of the people who constituted a nation, and this state of health could only be measured by the percentage of healthy human beings in the nation. For example, if a nation had 90 per cent. of its people healthy, strong, and energetic, and 10 per cent. diseased, weak, and spiritless, such a nation could confidently be said to have an exceptionally high standard of national health. If a nation had 75 per cent. of its people thoroughly healthy, physically, intellectually, and spiritually, and 25 per cent. diseased, such a nation had also a high standard of national health. If a nation had 50 per cent. of its people healthy in body, mind, and spirit, and 50 per cent. diseased weaklings, such a nation, no matter how high its civilization, how great its national prosperity, or how pure its religion, could not be said to have a satisfactory state of national health. If a nation contained only 25 per cent. of healthy people such a nation, although enjoying the full fruits of civilization and full of glorious institutions for the

relief of human suffering, had a low and dangerous state of health. Through the wide publication of the Registrar-General's returns, the words public health had come to be nearly represented by the birth and death rates. A good state of health, according to this, meant a high birth-rate and a low death-rate. The question was—did those figures give an intelligent or correct representation of the state of the national health ? He thought they did not for the following reasons. A high birth-rate was only a sign of national health when the great majority of those births were healthy. A low death-rate usually meant that the average span of human life was legthening, and that the life-preserving appliances—sanitary, medical, and philanthropic—were in good order; but it might also mean that a very large proportion of the drunken, dissipated, and diseased population, and their weak and degenerate offspring, were preserved alive by the efforts of philanthropy, aided by medical and sanitary science. In such a case a low death-rate might also mean a low state of national health. Even the absence of zymotic disease might not on the whole be an unmixed blessing. There was little doubt that modern sanitary science, if allowed full scope to act, could exterminate the cholera, smallpox, typhus fever, and many other epidemic diseases which plagued humanity, but under the existing circumstances of civilized humanity, it was doubtful if such a course would greatly improve the national health. When the propagation of the human species was done by the healthy members of society, and not, as at present, chiefly by the diseased, drunken, and dissipated, then, and not till then, will the extinction of all epidemic disease be an unmixed blessing to humanity. In his opinion the figures of the Registrar-General, although perfectly accurate and most perfectly compiled, did not fully represent the true state of the public health. They rather tended to mislead the public into a false sense of security by proving the public health to be good when it was quite possible that the national health might be in a low and most unsatisfactory condition. For example, according to the

Registrar-General, the district of London, with its high birth-rate and low death-rate, was a most remarkably healthy city; yet what was the fact? The most careful investigation could hardly find a person except a few diseased children among the working classes in London whose parents and grand-parents had been born in London; that meant London killed off its working-class population in three or four generations, and was being continually recruited by healthy immigrants from the rural districts. No matter how favourable the figures, such a city was not a healthy place for the working-class to live in. What was wanted was the Registrar-General to publish a health-rate showing the percentage of healthy and diseased people in the population, then the public could judge at a glance the true state of the national health. Had Great Britain 75 per cent. of its people healthy? had she 50 per cent. healthy? or had she only 25 per cent. of really healthy people in her population? On the answer to this question depended the whole future of the nation. If every century the percentage of diseased and degraded humanity was steadily diminishing, and the percentage of strong, healthy, and energetic people steadily increasing, then the life of the nation was assured and the future was full of hope and promise. The lecturer then took a hasty glance at the prejudicial effects which civilization had exercised on Grecian and Roman national life, and afterwards, referring to the case of the Jews, said that the method by which Moses solved the problem of restoring the national health of a diseased, degraded, and miserable people was masterful in its very simplicity, and consisted in compelling those people to live for forty years in conformity with the highest sanitary laws, and the general scope of those laws might be briefly described, making all necessary allowance for difference in the name and classification of diseases. The entire people were rescued from the contamination of civilization and the impure life of large cities, and removed to the solitudes of the desert and the fine bracing air of the mountains. Cleanliness of every kind was most rigorously enforced in a manner impossible in modern times. Food and

drink were put under lawful inspection, and nothing impure, unwholesome or liable to cause disease was allowed to be used. Every case of epidemic disease was isolated, the house purified, the clothing burned, and every person in contact with the disease isolated until cleansed and purified. In the treatment of such diseases Moses in many respects had anticipated modern sanitary science by about thirty centuries. The first lesson to be learned from the history of the Jews was that no civilization could kill a nation which elected to live according to the laws of God and Nature, and that it was not the civilization which destroyed the human race, but the lawless lives led by people who lived under civilized influences. Modern civilization would not perish because of its scientific triumphs, or its laws, or its literature, or its religion ; it could only perish in consequence of the lawless and unhealthy lives led by multitudes of so-called Christian people. The great hope of modern civilization was that in one form or another all Governments were beginning to realize the great eternal principle that the national health was the supreme law, but the efforts made in this direction were as yet very fitful and elementary, and could not for a moment be compared to the sanitary code voluntarily adopted by the Jewish people. No Government could stand for a year that would dare to propose a thorough sanitary reformation, interfering at every step with the Englishman's much-boasted liberty of the subject, which in plain language meant liberty to be as drunk as they liked, liberty to be as immoral as they liked, and liberty to propagate as much disease as they liked. As long as the public opinion of Britain endorsed such ideas no great improvement could be looked for in their national health, but the moment public opinion determined that the highest liberty was to live according to the laws of God and nature then, and not till then, could they have a marked improvement in their national health. If but for fifty years the Christian public would elect to live in that way they could not estimate the improvement which would take place, and their successors would thank them in a new and improved world, and in order

to understand this let them look with impartial eyes upon the present position of Christian Britain. All the citizens of this free country could drink themselves into all kinds of foul diseases, and their diseased, degraded children filled up the charitable institutions, and a benevolent Government afforded facilities for their doing so as quickly and as easily as possible. Numbers of persons were at large about the streets so thoroughly diseased that their very breath was infectious, and those persons brought into the world year after year whole armies of diseased children for a charitable Government to maintain. In fact, under the present benign Government there was no human being too wretched, too diseased, or too miserable that he could not contract a legal marriage and bring as many wretched and diseased children into the world as he was able to, and the public provided a comfortable existence for all these miserables. He could not but think the number of diseased and degraded humanity was slowly and steadily increasing, and it would soon require an electric lamp to discover a thoroughly healthy human being in this boasted country of ours. It appeared there was hardly such a being as a thoroughly healthy child born into this world, their parents being more or less diseased, and their modern education and examinations were well calculated to destroy the little health that was left. He believed the average health of this nation was twenty-five, and he would like to see the man who would tell him that that was satisfactory. That was no fancy sketch, but a grim and stern reality, as would be seen by considering a few facts and figures which were authenticated. If a drunkard only injured himself the loss to the national health would be but little, but the children were weak, puny, and scrofulous, and often idiotic and deaf and dumb. It was estimated that 50 per cent. of the idiots of Massachusetts were the children of intemperate parents. In the ten years following the reduction of the spirit duties in Norway insanity increased 50 per cent., and idiocy among children 150 per cent. in the same period. As to early marriage, also a prolific cause of disease in children, the last census returns showed that there

were 28,000 wives only 15 years of age and 169 widows of the same age in the United Kingdom. The great problem of the age before which all others, social or political, sank into insignificance was to restore to civilized man his long-lost health. It was by no means unsolvable or difficult of solution, the great difficulty being in their own minds arising from false ideas of delicacy, false ideas of philanthropy, and false ideas of religion. The first great step in improving the national health was to confer the franchise in a liberal manner upon women. Men would never legislate in a thorough manner to curtail his pleasure, though in this way he made whips to scourge whole generations of innocent women and children. Women who were the sufferers would best legislate upon such subjects. Drunkenness must be treated as a crime against the national health, and should be punished accordingly. To sell or give spirituous liquors to any person under 21 years of age, except under medical advice, should be a criminal offence; the marriage of immature boys and girls, and the production by this means of large families of weak children must be abolished *in toto*. The present system of cramming for examinations must also be done away with, and in every public examination health should carry as many marks as classics, mathematics, or English literature. Mankind in every age had formed himself into voluntary associations for many objects—the suppression of slavery, the abolition of the corn laws, the promotion of temperance, and in all those had done useful work in promoting reforms for the benefit of the human race. Now was the time to form a great society, having for its object the attainment of the highest possible perfection of the human race physically, intellectually, and spiritually, and such an association would be of the greatest value in correctly moulding public opinion, in guiding the action of Governments, and generally in promoting the attainment of the highest possible standard of national health. It was estimated that mankind had existed in this globe in some state or other for millions of years, and it was calculated that the world would be capable of human

habitation for some millions of years to come. The history of humanity was a bloody record of crime, misery, and suffering. Was this dismal record to continue for another million of years, or was a new era to commence—mankind every century rising in his health physically, intellectually, and spiritually, until they had a race of human beings full of health and intellect and spirit, as God intended them to be, and possessing a beauty that was Grecian, a grandeur that was Roman, and a spirit that was truly Christian?

Dr. WHITAKER—In the first place I may give expression to the pleasure I have had in listening to Mr. Scott. I am afraid, however, that instead of one lecture he might have given two or three. I would have thought that the subject of physical health would have been quite sufficient. I am afraid Mr. Scott rather trespassed on the ground of the clergy. The education of the present time appears to interfere materially with the physical strength of those coming forward. The younger people are pressed on unduly, and it seems to be a matter of how much they can know in a perfunctory sense without understanding; how they can answer questions and get through examinations. I confess that I do not agree with Mr. Scott in some of the matters brought forward, though every one he has mentioned requires very great and very serious consideration. At the same time I am not one of those who believe that legislation (even if ladies were members of Parliament) will make people good, happy, prosperous, and virtuous. All prosperity—all national health—must proceed from the people themselves. There is no doubt whatever that woman has a great deal to say to the health of any child, particularly in looking after household affairs. I have been thoroughly astonished occasionally in going through the slums of our city when I have seen one house perhaps in a dozen, or perhaps even two dozen, almost an oasis of cleanliness in the desert. Latterly the authorities are beginning to awaken to a sense of the duties being forced upon them; they are trying to make people healthier than they were, and although a city

like our own may be prosperous, still there can be no prosperity in any city unless the physical strength and health of the community be preserved and maintained.

Dr. Redfern—I came here fearing that Mr. Scott would have indulged in a number of statistics. I quite anticipated being told that when the death rate had diminished that indicated a very high condition of health, and I am very much delighted to find that Mr. Scott did nothing of the sort. I entirely agree with almost every word he has said. I feel that the subject he has brought forward is one of the most serious importance. He has touched the great causes which produce disease and fill our workhouses and lunatic asylums, and when such things as Mr. Scott has spoken of prevail and corrupt the community in such enormous numbers I see no hope of anything better except by the adoption of some such measure as Mr. Scott advocates against the propagation of disease and the production of poor, miserable, and feeble human beings.

Dr. MacCormac—I came here to-night to absorb not to criticise, and can say that I have not been disappointed in the nutriment. I think that what Mr. Scott has said has been put clearly, forcibly, and truthfully. The points he has touched upon are of the greatest importance; the proportion of the healthy to the unhealthy, and the history of ancient races compared with the people living at the present time. At the same time I would take the liberty of saying that these are subjects which have not been neglected. The medical profession has been dealing with these subjects to the very best of its ability, and with very great success. What I would like to have heard from Mr. Scott would have been something of sanitation. This would have been most interesting, because it would have had the effect of perhaps throwing light on the mode by which the diseases of which we have heard could be grappled with. I do not think that because persons suffer from certain diseases they are to be looked upon as loathsome creatures. They could not perhaps have been able to avoid them. Drunkenness is not the only cause of disease. I do not for one moment say that it is a

minor cause. We have typhoid fever, smallpox, and diphtheria. Are all these produced by drunkenness? We want some means to do away with these diseases. What are these means? As a prevention from disease I do not think that even the most perfect water system would accomplish all that is desired. Is there nothing in nature by which she may rid herself of all the contaminations that may occur? I think there is, that there is a fundamental force, an all pervading force which nature herself uses in most important instances, and that force, I hold, is electricity. I speak not as an enthusiast, for at the present time in Havre electricity has been adopted as a purifying agent, and has purified sewers that were seething with pestilence.

Mr. P. C. Cowan—I think Mr. Scott takes a very pessimistic view of his subject. His ideas seem those of the Old Testament, and he appears to forget altogether those of the New Testament, which are later, quite as different and quite as authoritative. I must confess to disappointment that the paper is so abstractly theoretical, and so very impracticable, except towards the end. Note carefully, he attempts to take into account not only the bodily but also the intellectual health. I do not doubt his ability, but I do not understand how he obtains an exact numerical value, such as the 25 per cent. average of national health he assigns to these islands, as it appears quite beyond human powers to measure spiritual and intellectual health. It is possible to make progress by taking as a guide the usual statistics of health, but, in my opinion, quite impossible to make any progress in the improvement of public health by the use of such fanciful measurements as Mr. Scott proposes. Evidently any town, however high its death rate, might claim to have the highest value of national health on Mr. Scott's scale, if there were enough self-conceit in the community, as it might easily be asserted, and who could prove otherwise, "O, though we are dying by scores by all kinds of disease, we make up for and over-balance that by our ability and fine qualities of mind and soul." To a certain extent I agree with Mr. Scott that there should be punishment for

disease, as I believe there was much justice in the opinion of an old teacher of mine that every case of typhoid fever should be followed by a criminal prosecution.

Mr. MILLIGAN—I think one of the factors that tended to advance national health in ancient times was the fact that women engaged more in athletic exercises than they do in the present day. It is the duty of our Town Council to provide open spaces where children can play, and parks for athletic games; and if the people were more careful in their food a higher standard of health could be attained.

Mr. GREENHILL—I agree with Mr. Scott's remarks to a very large extent. It has been said that you cannot make a man sober by Act of Parliament, with that I entirely agree; but you can to a very large extent prevent him getting drunk by legislation. I also consider that a parent should be made amenable for sending a child out to the street half-clad. One point strikes me particularly, the matter of infantile insurance. To my mind it ought to be absolutely impossible for any parent to insure his child's life so as to benefit by his death. I think if that were prevented greater care would be taken with regard to the maintenance of the children's health. I won't touch upon the question of purifying sewage by electricity, because it is a subject of which I know very little, but I have no doubt that the experiments which are being carried on at Havre and other places will prove of immense benefit to the large cities where there is great difficulty with regard to the disposal of the sewage.

Mr. SCOTT—I must thank you for the manner in which you have received my paper, and I consider the compliment paid to me by such a man as Dr. Redfern, a gentleman whose reputation is not only local but European, an ample return for any trouble I may have had. Dr. Whitaker thought that the moral had nothing to do with the national health; I entirely disagree with him. If you leave the moral and the spiritual out, you will have little left. In reply to Dr. MacCormac, who understood me as making some remarks against the medical

5

profession, I may be allowed to say that there is no one here who has a higher opinion of that profession. We owe very much to the medical men. I like to have an argument with a man like Mr. Cowan. He says it is impossible for me to form an approximate health rate. I think if he will look deeper into the matter, he will find that it is not impossible. I have read reports of doctors upon thousands of school-children as to their condition of health, and have carefully gone into the whole subject, and I am convinced that my estimate is not too low. Mr. Horner has raised the question of the ventilation of sewers, but that is not the subject this evening. Two years ago the subject was discussed here night after night, and it is not necessary to bring it up again. I like the remarks of my friend, Mr. Milligan, about open spaces. Everything to promote the health of the rising generation, such as open spaces, gymnastics, etc., should be encouraged and provided for.

6th February, 1894.

MR. ROBERT LLYOD PATTERSON, J.P., in the absence of the President (Professor FitzGerald), occupied the Chair.

MR. GEORGE ROCHE, of Dublin, gave a Lecture, entitled

THE AMERICAN MAIL SERVICE.

THE LATE MR. JOSEPH JOHN MURPHY.

Prior to the delivery of the lecture,

Mr. PATTERSON said he regretted that the President of the Society, Professor Fitzgerald, was not present, and in his absence he, as one of the Vice-presidents, took the chair. He was no stranger to that position, as he was President of the Society many years ago, and he could say that, excepting the Chamber of Commerce, there was no room in Belfast in which he felt more at home than in that room in which they were assembled. He regretted that his first duty on taking the chair was to perform a duty that was a very painful one to him in consequence of the nature of the motion he was going to submit for their consideration in a few minutes. And yet, having regard to the degree of intimacy, and friendly relationship that existed between the family of the late Mr. Joseph John Murphy and his own family for a very lengthened period, he thought the motion he was about to submit to them would be considered to come not inappropriately from himself. It would be fresh in the memory of all of them that Mr. Murphy had been called away to another world within a very recent period ; and under those circumstances, when they had lost such an old and valued and prominent member of their Society, it was only right and fitting that a vote of regret should be passed for his departure and a vote of sympathy and condolence conveyed to his relatives. Mr. Murphy had been elected a

member of that Society so long ago as November, 1849, forty-four years ago, and he was for a very short time a member when the usefulness and industry of which he afterwards gave such remarkable instances began to show themselves. He read his first paper before he had been three years a member of the Society. He was elected a member of the Council in 1852, and he continued a member of the Council uninterruptedly from then to the date of his death, last month—a period of over forty-one years. During that time he was treasurer of the Society for a considerable period. He was president on several occasions, and he was one of the three trustees of whom he (Mr. Patterson) regretted to say he was now the only survivor. The other was Mr. William Bottomley, who was called away some years ago, and now he had to regret the loss of his other colleague, Mr. Joseph John Murphy. He had before him a list of papers which Mr. Murphy delivered from 1852 up to 1866, when he lost his wife. His more immediate and active interest in the Society ceased about this time—he meant his active interest in so far as appearing at its public meetings was concerned, but his interest in it as the invaluable editor of its proceedings continued uninterrupted. With these observations, which he spoke under very considerable feeling, he begged to submit the following resolution to their consideration:—"That at this, their first meeting since the lamented death of Mr. Joseph John Murphy, one of the most eminent of our past presidents, the Belfast Natural History and Philosophical Society desire to place on record their deep sense of the loss the Society has sustained in Mr. Murphy's removal from one of the many scenes of his long and useful labours—one where his wide reading, his untiring industry, his love of research, and his ever ready willingness to impart information to others from the wealth of his well-stored mind rendered him for over forty years one of the most valued members. Of him it may truly be said that, while his kindliness of disposition, his broad sympathies, his unostentatious generosity and his many good qualities of head and heart endeared him to to his family and numerous friends, his singlemindedness,

unselfishness, and transparent honesty of purpose commanded the respect of all. That it be an instruetion to the Hon. Secretary to forward a copy of this resolution to Mr. Isaac J. Murphy, and to convey to him the sympathy of the members of the Society with him and his family in their recent bereavement."

Dr. REDFERN, in seconding the motion, said Mr. Patterson had known the late Mr. Murphy long before he came to that Society, but everyone in the city who took any interest in physiology, in mathematics, any interest in the welfare of the community in general, had known Mr. Joseph John Murphy. He was sure no one had been more prominent or more earnest in every way in seeking the good of that Society and of every member of the community than Mr. Murphy. It made no difference whether the subject was one which interested a great body of persons interested in natural history, in geology, in the history of the world, in the history of their institutions, in physiology, in mathematics, in astronomy—it was Mr. Murphy's earnest desire to promote as far as he could, and that was to a very much greater extent than fell to the lot of many persons living in his time, the good of those subjects and of the community. He was sure everyone had felt with Mr. Patterson, though not so closely acquainted with Mr. Murphy as that gentleman was, the loss which Mr. Murphy felt by the loss of his amiable wife, and although that loss caused Mr. Murphy to cease attending the public meetings of the Society, he had displayed his interest in a more permanent and more important way even since that time than before in the Society's proceedings. They had lost a friend. They had lost one to whom he was sure everyone could have applied for assistance and advice under any circumstances in which he might be placed, especially in connection with any of the subjects he had mentioned, and he was sure there was no one in Belfast who had ever heard the name of Mr. Murphy but would sympathise deeply with Mr. Patterson, with that Society, and with the family of their departed friend in his removal from amongst them.

The motion was passed unanimously.

Mr. PATTERSON, in vacating the chair, which was taken by Mr. John Greenhill, the President of the Chamber of Commerce, explained that it had been originally intended that the lecture should be delivered under the auspices of the Chamber, but that it had been thought better those proceedings should take place in connection with that Society.

Mr. GREENHILL said he felt it to be quite a privilege to preside in that historic room, where so much valuable information had been conveyed from time to time. He was indebted for that honour to the courtesy of their President and Secretary, and also to the kindness of the excellent Hon. Secretary of the Chamber of Commerce, Mr. Patterson. In referring to the subject for that evening's consideration, he thought he might say that an expeditious and regular mail service was of very great advantage to any community, and to a community of manufacturers and men of commerce it was of very special significance indeed. He had observed, and he was sure they had likewise observed, that in contrasting the advantages of Southampton, and Queenstown London had been very prominently considered as the place to and from which the times of each route should be taken. He did not wish to minimise in any way the claims of London in making calculations with regard to the advantages of one service or the other, but it did occur to him that perhaps there were other districts of England that were to be considered as well as London. He had been informed that a very much larger number of letters passed between the United States and the manufacturing districts of England than between the United States and the city of London. He would therefore urge that in considering the five millions of people in London, they should likewise consider the five millions of manufacturing inhabitants of Yorkshire and Lancashire, and in that connection he thought it would be well if those who were interested in making comparisons with the object of showing which was the better route —Queenstown or Southampton—would also make a comparison to show which of those two routes would be more suitable for, say, Manchester, as the centre of a very important manufacturing

and commercial community. He did not think that it would be wise for him to occupy their time any longer, as they had come there to hear their friend Mr. Roche, whom they cordially welcomed to Belfast.

Mr. Roche, who was received with applause, then delivered his lecture, which he prefaced by saying they had heard from the Chairman that not only London but also the various manufacturing parts of England should be considered in deciding definitely which route was ultimately to hold the field. He thought he would be able to show that evening that Queenstown was far and away the better route for the great bulk of the people of the United Kingdom. While Southampton undoubtedly possessed advantages, especially in connection with the passenger traffic, Queenstown was assuredly far beyond Southampton in its advantages with reference to the mail service. He thought they would mostly agree with him that the great object to be attained in the improvements in respect to the mail service which had been spoken so much about during the past year or so was to decide on such a service as would enable the Wednesday's letters from New York to be replied to on the following Wednesday by the outgoing mail steamer from Liverpool, calling at Queenstown on Thursday morning, and Saturday's letters from New York to be replied to by the outgoing Cunard steamer on the following Saturday from Liverpool and Sunday from Queenstown—that was, to have the Saturday's and Wednesday's letters replied to within a week of the time they were sent from New York, and *vice versa*. That was a feat which had actually been accomplished over and over again during the past season by the Queenstown route, not only in the summer months, when the Atlantic Ocean was comparatively calm, but also during the stormy weather of the past few months. There was another fact which ought to weigh with them in the consideration of that question. During the first four or five months of the existence of the Southampton route vessels sailed from both Southampton and New York on Saturdays, the same as the

Cunard steamers from Liverpool and New York, and while that state of things prevailed not in a single instance did Saturday's letters from New York arrive at Southampton in sufficiently good time the following Saturday to allow even the Southampton people to reply to their own letters by the outgoing steamer on the following Saturday, and when the inhabitants of Southampton itself were unable to do that, what could be said of the people in the rest of the kingdom? All that was immensely in favour of the Queenstown route. On a Saturday evening during the past summer, when he was at Southampton, the City of Paris arrived at the docks at 5.30, and the letters conveyed by her reached London at 9.30 the same night, even after the night mail trains had left for the North. The first question the American passengers asked was, "What about the Campania?" which was to leave New York half an hour after their vessel had left, and they were thoroughly disgusted when they were informed that the Campania had landed her mails at 9.30 on the previous Friday morning at Queenstown, and that the letters had been delivered throughout the kingdom on Saturday morning, whereas those brought by the Southampton route were not delivered until the Monday morning. He mentioned that fact to show that, although there had been a good deal of talk about improving the local service between Queenstown and London—and he believed that it should be improved to the utmost extent that the most modern engineering inventions would permit—yet the superiority of the Queenstown route was not dependent upon any such improvements, for at the present moment it was infinitely superior as far as the delivery of the letters throughout the whole of the United Kingdom was concerned. The President of the Liverpool Chamber of Commerce, Mr. M'Arthur, recently said, as far as Liverpool was concerned, the adoption of Southampton in preference to Queenstown would mean that they in Liverpool would have to post their American letters twenty-four hours earlier, and that they would receive their American correspondence ten and a half hours later. That was a very serious difference, and when

they added the difference of the journey from Liverpool to Belfast and compared it with the Queenstown journey, they could easily judge what the change would mean to them in the North of Ireland. There was another argument in favour of the Queenstown route, which might be called a patriotic one, and that was that, while the liners which adopted the Southampton route all sailed under a foreign flag, those on the Liverpool route carried the mails under the British flag, and, moreover, could be used in case of war for the defence of their country. Still another fact to remember was that on the Queenstown route the letters were all sorted between Queenstown and London, while on the Southampton route they reached the General Post Office, London, for the most part unsorted. Mr. Roche threw upon the screen numerous diagrams, contrasting the merits of the two routes One table showed that, taking the average of eight voyages by the Southampton route, the journey was accomplished in 6 days 19 hours 53 minutes, while the average of nine voyages made by the Campania and Lucania on the Liverpool route was 5 days 15 hours 28 minutes. The Lucania at present held the record for the fastest westward passage, her time being 5 days 12 hours 47 minutes, while the Campania held the record for the best eastward voyage—5 days 12 hours 7 minutes. After exhibiting views of the Teutonic and Majestic, which were received with applause, the lecturer said when it was borne in mind that those fine vessels had been seven years longer on the service than the Lucania and Campania, and that they had never been beaten by more than three and a half hours, notwithstanding the enormously increased horse power of the Lucania and the Campania, he thought they might practically say that up to the present the Teutonic and Majestic were unbeaten as splendid specimens of Transatlantic liners. One of the chief weapons used by the Southampton people was misrepresentation; they stopped short of nothing which would in any degree favour the Southampton route; but, notwithstanding all their efforts, it could easily be proved that the Queenstown route was much superior for the carrying of the mails, for letters

posted in any part of England could reach New York quicker by that route than by the steamers from Southampton, and even letters posted in Southampton itself could be despatched at a later hour by the Queenstown route, and yet arrive at their destination as soon or sooner. The transmission of the mails from Queenstown to London had been accomplished in as short a time as thirteen hours twenty minutes, although the distance covered was 516 miles including sixty-four miles of water, and he believed if the postal authorities could be prevailed upon to adopt some quicker method of loading and unloading the mail bags that time could be considerably reduced. Mr. Roche exhibited several views illustrative of the journey from Euston to Queenstown, and others depicting the arrival and departure of Atlantic liners by both routes. Alluding to the benefit derived by Ireland in consequence of American visitors disembarking at Queenstown instead of proceeding direct to Liverpool, he strongly advocated the adoption of some system of through tickets, which would give travellers the option of sailing all the way to Liverpool, or, without any further cost, of proceeding by rail from Queenstown to Dublin, instead of the present system, under which those who chose the latter course had to pay extra for the privilege. In concluding a deeply interesting lecture, Mr. Roche said he thought from the facts he had placed before them the audience would be able to form some idea of the importance they ought to attach to the question of the Queenstown mail service.

The lecture was much enhanced in value and interest by over a hundred original lime-light photographic views taken by Mr. Roche, including several large pictures of the Teutonic, Majestic, Lucania, and Campania.

Mr. Herbert Lanyon, in moving a vote of thanks to Mr. Roche for his lecture, said what struck him as a very important thing was that such vessels as the Teutonic, the Majestic, and other large vessels which sailed under the English flag could be utilised by the English Government in case of war for conveying their troops from one part of the kingdom to another, and

therefore they should be subsidised by the English Government as far as possible. The captains of these vessels were naval reserve men, and if the English Government subsidised ships that sailed under the American flag they would be subsidising ships that might be the ships of the enemy in case of war. He though that would be a serious matter, and as Britishers they should do all they could to have their mails carried under the English flag. Another matter of importance was the large number of passengers that would be landed at Southampton if it were selected as the mail route. He thought it would be a great injustice to Ireland if American passengers, who spent a large sum of money yearly as tourists in going through Ireland, were carried past Queenstown and landed in England. That would be a grievance of which they would have more cause to complain than many of the imaginary grievances that people talked so much about.

Mr. F. D. Ward, J.P., in seconding the motion, which was passed, said the lecture to which they had listened could only do good, and he hoped the result of it would be that the Queenstown route would be ensured to them for the conveyance of the American mails.

The lecturer, in acknowledgement, said he was not interested in any of the companies that were concerned in the question of the mail service.

The proceedings then terminated.

6th March, 1894.

Professor FitzGerald, President of the Society, occupied the Chair.

Mr. Robert Patterson, M.B.O.U., Honorary Secretary of the Ulster Fauna Committee, contributed some Notes on

THE OCCURRENCE OF THE MARTEN (MARTES SYLVATICA) IN ULSTER.

He gave particulars of the discovery within the past few years in the various counties of Ulster. In County Down one of the most recent discoveries was in 1891, at Finnebrogue, near Downpatrick, which had been stuffed, and presented to the Museum by Major Maxwell. In October of the the same year another was caught near Bryansford, which was also on view. This specimen seemed to have been trapped before, as one of its legs was gone. He had not been able to obtain any recent records of the presence of the Marten in the Counties of Armagh, Monaghan, Londonderry, and Tyrone. He would be glad to hear of any other appearances of this somewhat rare animal in the different counties of Ulster.

Mr. R. M. Young read some Notes on

A RECENT FIND OF IRISH ELK BONES IN BELFAST.

He said in connection with the great system of main drainage which was now approaching completion, under the able superintendence of Mr. J. C. Bretland, M.I.C.E., the city surveyor, excavations for an intercepting sewer were made in

January of this year. Under the footpath on the east side of High Street and Castle Place a quantity of human bones were dug up, opposite St. George's Church, where the burying ground of the previous Church of St. Patrick extended, but it was not until the workmen reached Castle Place that anything of special interest was found. On January 18th an intelligent working man brought him three jaw bones, which had been taken from a depth of seven feet under the footpath, at Mr. Watson's shop, No. 10 Castle Place. Prof. R. O. Cunningham, M.D., kindly examined these bones, and pronounced them to be those of an Irish elk, horse, and sheep. Opposite Messrs. Hart and Churchill's shop quite a number of jaws of the Irish elk were turned up, with some fragments of leg and rib bones. These were associated with branches of trees, probably willow, and were six feet ten inches under the surface of the flags of the footpath. Mr. S. F. Milligan, M.R.I.A., secured some bones, apparently of the horse and dog, which he has kindly presented to the Museum. The Museum's specimen of the Irish elk surpassed in size the largest living deer. Its antlers were sometimes eleven feet from tip to tip, while those of the moose were only four feet. The most recent discovery of Irish elk bones seemed to be that described Mr. R. L. Præger, B.A., M.R.I.A., on February 16th, 1892. They consisted of a skull found in the preceeding December in excavating near the Spencer Basin. It was in the centre of a peat bed, three feet thick, with a depth of thirty feet of estuarine clay above. On the same bed of peat at the Alexandra Dock bones of the deer and wild boar occurred. The present find of Irish elk bones seemed to be the first to be noted within the city boundaries. These bones were lying almost on the surface of the estuarine clay or sleech, and the Irish elk, horse, and sheep bones were found close together, as if either swept down by some flood or possibly deposited in such by human agency. This latter supposition was strengthened by the remarkable appearance of some of the larger bones, which apparently had been broken into short lengths to extract the marrow. They resembled in this

respect the bone so treated by the cave men and the Swiss lake dwellers. In 1868 a similar find was made near the Broadway Factory, and amongst the bones then found were some of the red deer, which had artificial markings, where the flint tools had been at work. Another recently discovered relic of the past was the supposed canoe, which was cut through in driving sheet piles at the waste ground close to the Albert Bridge, where some works in connection with the main drainage had been going on. He and Mr. Lavens M. Ewart visited the place in December last, and saw at the depth of ten feet the trunk of an oak tree, four feet in diameter, which had been burned out on the upper side like a canoe. The part which was cut out by the piles measured six and a half feet long, by four feet wide and three feet deep. The thickness of the sides was not more than six inches, and the wood was sound in the middle. The two extremities of the tree was undisturbed in the sleech at that time, but he understood that one end had been laid bare, and it forked off into two branches. As the other end was still uncovered, it might show visible signs of a canoe in process of formation if laid bare.

Professor FitzGerald apologised for having to leave the meeting, and

Mr. W. H. Patterson presided during the remainder of the meeting.

Mr. S. F. Milligan read a Paper on

IRISH ARCHÆOLOGY.

Mr. S. F. Milligan, who was cordially received, said—It is not the first time I have had the privilege of addressing this society on Irish archæology. On the present occasion I propose to deal with the mode of living, culture, and social customs, illustrating the every-day life of the people in ancient Ireland. Before the Christian era this country had advanced so far as to possess a

code of laws, a regular government, orders of learned men, and public schools. After the introduction of Christianity these laws were revised to suit the altered conditions of society, and for over one thousand years after, with very slight alterations, these laws called the Seanchus Mor, were those which ruled the lives and liberties of Irishmen, and by which they were governed. In the early Christian period the island made great progress in religion and culture, so much so that it became known as the Island of Saints. During this golden age of Irish history for a period of over 200 years, commencing with the early part of the 6th century, the country produced a host of Christian missionaries, whose names became well known over Western Europe, and caused Irishmen to be loved and respected wherever they went. They were known abroad as Scots of Erin, though they themselves prefered to be called Gaels. After the invasion of the Northmen and their kindred, the Normans, religion and progress received a serious check. Men had to turn from the arts of peace to those of war, with all its train of attendant evils. During the peaceful period from the year 600 to the middle of the 9th century, Irishmen were unequalled in the art of illuminating manuscripts, whilst her learned men were advanced in all the essentials of a liberal education. They understood Latin, Greek, and even Hebrew, were thoroughly read in the sacred scriptures, and it was probably from their love of Holy Writ that they spent all their artistic genius in illuminating its pages so profusely, They were well versed in mathematics and astronomy as then known, and some had advanced views on the latter science much ahead of their times. To the great schools of Armagh, Clonard, Durrow, Clonmacnois, Bangor, and Moville, flocked thousands of youths, many of noble birth, who came from Britain and Gaul, so celebrated were these ancient Irish seats of learning. The insular position of the country saved it for a long period from the dark cloud of ignorance that spread over the rest of Europe after the downfall of the Roman Empire, until the northern hordes arrived, who were quite as much at home on sea as on land. They ravaged the monasteries, carrying off the sacred vessels,

manuscripts, and everything they could take they destroyed. To form a correct idea of a Celtic monastery you should exclude from your minds everything you have read or seen of Gothic Romanesque architecture, such as the ruins of monasteries like Adare, Quin, Holycross, Mellifont, Jerpoint or Greyabbey. These were all Anglo-Norman, not Celtic. The Celtic monastery consisted of a collection of circular, wattled, or stone beehive huts surrounded by a circular eastern rampart called a rath, or a huge dry stone built wall, 10 or 12 feet thick, called a cashel. Each brother had a separate little hut or cell, in which he studied and slept. The students constructed similar huts or booths, which assumed the form of a village. Those who were able paid for their food, and those who were not received their support from the people of the district. It was in schools like these that Columba, Columbanus, Galus, Colman, Adamnan, and others were educated, who became great missionaries and teachers, and preached the Gospel to various European nations. From the peculiar habits and traditions of the Irish race, architecture at that period had not attained that position to which it was entitled, and to which at a later period it reached. No doubt the round towers were erected about the end of the time we are referring to, and for graceful proportions and excellent workmanship stand unequalled. It would seem that the men who built them were capable of doing work of a much more elaborate kind. In the 11th century the Irish did direct their attention to the erection of better churches, and such as Cromac's Chapel and Queen Dervorgille's Church at Clonmacnois, both built by native workmen. They invented a peculiar style of stone roofing, unique in its way, and almost indestructible. English writers who dispute our claims to a higher culture and earlier civilisation than theirs generally ignore reference to the remote ages, and point to the condition of Ireland in the Elizabethan age in proof of their statements. It is well known that the decadence of the country had reached its lowest point at the close of the Elizabethan wars. The social condition of the common people was deplorable, being hunted to the woods like wild

beasts, without food or shelter. Is it to be wondered at if they were taunted by being called savages? The state of Munster after the wars of Desmond, and of Ulster after those of O'Neill, show to what depths of suffering and misery the mass of the people were reduced—as tillage had been totally neglected, and no security for property existed. A thorough knowledge of the manners and customs of the Irish people, as well as an aquaintance with the code of laws by which Ireland was governed for such a lengthened period, would have been invaluable to English statesmen legislating for this country. It has been to the utter want of such knowledge in the past that Ireland has not been assimilated more thoroughly with England. Whilst the words of many Continental languages have been absorbed into English, it is remarkable how Irish words have kept coldly aloof, or have not formed any portion of that tongue. We need not push these ideas further than to express an opinion that archæology and legislation could have been associated with advantage to the nation. No European nation can show so many ancient manuscripts relating to remote times as Ireland. These deal with every possible subject. There are copies of the Brehon Laws, innumerable tales and poems of the early heroic ages, written in the Homeric style, together with such works as the "Annals of Donegal," by the Four Masters; "Annals of Ulster," of "Innisfallen," of "Clonmacnois," the "Chronicum Scotorum," &c. These works were written by professional historians, to whom the severest penalities would attach if they falsified them in the slightest degree. No people, with the exception of the Jews, were more careful to transmit accurately their genealogies and history. The ollamh, or historian, did not receive his degree until a period of from nine to twelve years had passed in the closest study and the most severe tests. The French Government in the year 1881 despatched an eminent professor of Celtic to this country to examine and report on our ancient manuscripts. In his report, published afterwards, he stated there are fully 1,000 Irish manuscripts still existing, many of them of great bulk, and very many which had not yet been translated.

In addition to those in the Dublin libraries, the British Museum, and the hands of private collectors, there is scarcely a first-class Continental library that does not possess copies of our ancient manuscripts, carried from this country by Irish monks from the sixth to the tenth century. The Bardic schools were next referred to, and the mode they adopted and other interesting details of their system of teaching. These schools were in existence as late as the seventeenth century. The schools, taught by the monks, as distinguished from those taught by the bards, were next referred to, and the great success that attended these ancient seats of learning. The lecturer gave a translation from the Latin of a poem written about the year 820, by an Irishman who travelled in Italy, and became a bishop near Florence. As it refers to Ireland of that remote time it is worth repeating :—

"Far westward lies an isle of ancient fame—
The best of countries—Scotia is her name.
An isle enriched with an exhaustless store
Of gems, of garments, and of golden ore.
Her soil prolific teems with native wealth,
Her air breathes mildness, and the gales of health.
Her verdant land with milk and honey flows,
And nature here her choichest gifts bestows.
Her cultured fields are crowned with waving corn,
And art and arms her envied sons adorn.
No savage bear with lawless fury roves,
Nor ravenous lion, through her peaceful groves
No poisonous reptile wounds, no scaly snake
Twines through the grass, nor frog annoys the lake;
An island worthy of the Scottish race;
In war illustrious and unmatched in peace."

Last week, in Dublin, Dr. Sigerson, of that city, delivered a lecture, entitled "The First Saint of Erin." Most people, if asked who he was, would probably reply, St. Patrick; but it was not he to whom the learned doctor referred, but a saint very slightly, if at all, known to Irishmen until brought forward now to the light of day. The learned doctor said he was called Sedulius, lived before St. Patrick, when Nial of the nine hostages was king. He travelled to Britain, Gaul, Italy,

and finally reached Greece. He was a bard, and from his great ability was elected to be professor of rhetoric at Athens. Here he became acquainted with a Christian priest called Macedonius, who converted him to Christianity. He afterwards wrote a beautiful Christian epic called "Carmen Pasquel," an Easter ode. Many copies of this poem were made until the art of printing was invented, when it was first printed at Leipsic, and since that time fifty-one editions of it have been printed. This is a very striking illustation of the learning of the Bardic order in Ireland before Christianity became the religion of the State. He could multiply instances of Irishmen attaining high positions for their learning on the Continent. The Emperor Charlemagne appointed two Irishmen to take charge, one of the great school in Paris and the other in North Italy. The writer who records this refers to them as "two Scots of Hibernia" incomparably skilled in human and divine literature. An Irishman named Feargall about the year 748 taught a school in Bavaria. He held the opinions that the earth was a sphere, the existence of the antipodes, and diuranal motion of the earth on its axis. I need scarcely say these views were quite unknown on the Continent at the time, and he was reprimanded by the Pope for holding such views. Previous to the introduction of the present system of National education there was scattered over Ireland, even in remote districts, good classical and mathematical teachers, and it was no uncommon experience to find a barefooted boy whilst herding cattle reading Latin. The lecturer next described the kind of houses the people dwelt in, the earliest form being circular, with cup-shaped roof, and the fire in the centre of the floor. The people were pastoral, living mainly by flocks and herds, not tilling much of the ground. The dress and weapons were referred to, as well as the mode of living of the chiefs and people in the middle ages. The houses of the chiefs during the Tudor period were constructed of huge frameworks of timber, filled in with clay, and covered with thatch. Later again, during the reign of James the First, what were called bawns were built—a stone house or castle, and attached a

large quadrangular enclosure with towers at the angles ; this enclosure was intended to protect the cattle. The people were extremely hospitable in all grades of society. The chiefs kept an open house, the banqueting place of the clan, or, as the bards delighted to style it, "An open-doored festal gift-bestowing, white wattled lime-washed pile, in which mead and metheglin flowed without stint." In return the kings and chiefs when making a tour through their territory lived on the members of the clan. This was known as coshery, and originated in the righ, or king, collecting his cess or rent. The Norman barons continued this Irish custom, and the coshering visitations made by Ormond, Kildare, and Desmond so late as the middle of the 16th century is described in a state report of the time as follows :—"These earls, with their wives, children, and servants, do use, after the custom of Irishmen, to resort with a great multitude of people, to monasteries and gentlemen's houses, continuing there two days and nights, living at their pleasure, and their horses and grooms are maintained by the neighbouring farmers ; so as they be found in this manner in other men's houses more than half the year, and spare their own. Gerald, eleventh earl of Kildare, on such occasions travelled with a train of 500 horsemen, who were quartered on the farmers of the district. As an example of the prices of food, the following is copied from an old tract written in 1589 :—A barrel of wheat, or a barrel of bay salt containing three and a half bushels Winchester measure, is sold in Ireland for four shillings ; malt, peas, or beans, for two and fourpence ; oats for one and eightpence ; a fresh salmon, worth in London ten shillings, for sixpence ; twenty four herrings, or six mackerel, six sea bream, a fat hen, thirty eggs, a fat pig, one pound of butter, or two gallons new milk, for one penny ; a red deer without the skin, for two and sixpence ; a fat cow, thirteen and twopence ; a fat sheep, one and sixpence. There be great store of wild swans, cranes, pheasants, partridges, heathcocks, plovers, green and gray curlews, woodcocks, rails, and quails, and all other fowls more plentiful than in England. You may buy a dozen quails for threepence, a dozen woodcocks

for fourpence, and all other fowls rateable. Oysters, mussels, cockles, about the sea coast are to be had for gathering in great plenty." A very interesting description of Ireland about this time (1588 to 1589) is given in a letter written by a Captain Cuellar, a Spaniard. His vessel, with two others belonging to the Armada, were wrecked on the coast of Sligo, and he escaped, and travelled through a portion of Leitrim, Fermanagh, and Tyrone until he reached O'Cahan's Castle, at Limavady. He did not remain their, but ultimately escaped from the coast, at or near Dunluce, from whence, with other Spanish refugees, he reached Scotland, and ultimately Antwerp, where he compiled this letter of his travels through Ireland. As to the mode of living he says—"The people live in huts made of straw, the men are big-bodied, with handsome features and limbs, active and nimble as roe deer. They eat but one meal in the day, and that at night. Their usual food is butter and oaten bread. Their drink is sour milk, having none other. They do not drink water, which is the best of all. They dress, after their fashion, with tight hose and short coats (sayas) made of coarse goat's hair. They cover themselves with cloaks, and wear the hair down to the very eyes. They are great pedestrians, and very enduring as regards fatigue. They are continually at war with the English, who hold garrisons near by in the Queen's service, and from whom they defend themselves, not allowing them to enter their territory. They sleep on the ground on freshly cut rushes full of water and frost. The most of the women are very handsome, but ill arranged (tothery) wearing only a shirt and a cloak, which covers them entirely, and a linen cloth which they double closely about the head, tieing it in front. They are very domestic, and very laborious after their fashion. These people style themselves Christians, and mass is said amongst them, their ritual being that of the Roman Church. Nearly all their churches, monasteries, and hermitages have been pulled down by the English garrisons, and the natives who have joined them, and who are just as bad as the English ; so that finally in this kingdom there is no justice or reason, since that

everyone does according to his will." I cannot afford space to give any more of Cuellar's narrative, which is of great interest. Reference was next made to the various orders or grades of society in Ireland, marriage and other customs. The musical culture of the Irish, the old airs, and different instruments of music were mentioned. In Celtic Ireland a harper's person was sacred wherever he went. They had peculiar priveleges and immunities, which were recognised over the whole island, were received and treated with the greatest hospitality wherever they went by all classes of society. Every king and chief had his bard. On the 12th of July, 1792, the last meeting of Irish harpers was held in Belfast. At this meeting only ten harpers could be collected in all Ireland. They played all the old airs as they had been handed down to them from time immemorial. The music was written down by Edmund Bunting, and thus saved from being totally lost. A great social function in ancient Ireland was the Aenachs, or fairs. Here the people met from every district in great numbers. They were somewhat like the Grecian games, and lasted in some instances for several weeks. They were originally instituted in memory of the death of some great king or chief, and were held to commorate his memery. Horse racing, chariot racing, running, wrestling, and various games were celebrated before the assembled people of the district. Prizes were given to the successful competitors. These games in later periods had become known as patterns, but owing to the drunkenness and other causes, the clergy have almost suppressed them. It was at these fairs that the boys and girls met and matches were made, and they were looked forward to with the greatest possible interest. It would be impossible to condense in a small space anything but the merest outline of our ancient social customs, the laws relating to the various classes of society, their duties and privileges. Each grade of society had their rights and privileges regulated by law, from the king to the labourer ; laws regulating the settlement of the land between the various tribes and families ; laws concerning gifts, aliens, loans, pledges, and securities ; for instance, any tool by which a

person earned his living could not be kept in pledge. The fees of doctors were regulated by the old laws, and the position and way the doctors house should be built was stipulated. The fees of lawyers and teachers were stipulated, and a series of laws relating to weaving, spinning, brewing, and building, landlord and tenant, master and tenant. These laws are all in existence since the fifth century, as they are now and were in existence centuries before that in probably a slightly different form. The colonists which landed on these shores from Egypt, Greece, or Spain brought with them an advanced civilisation, from which sprung the ancient code of laws, bardic schools, orders of learned men, poets, musicians, and historians. We Irishmen are deeply indebted to such men as Dr. Petrie, Bishop Reeves, John O'Donovan, and Eugene O'Connor, as well as others, for unravelling the tangled skein of Irish history from manuscripts, the oldest in Europe, from buildings hoary with the lapse of centuries, which show the position our country held in religion, learning, and culture in remote times.

Messrs. W. Gray, W. Armstrong, and the Chairman offered a few complimentary remarks on the the papers.

Messrs. Young and Milligan having replied,

The proceedings terminated.

3rd April, 1894.

Professor FitzGerald occupied the Chair.

Professor William Knight, LL.D. (University of St. Andrews), delivered a Lecture on

THE HIGHER EDUCATION OF WOMEN.

The Chairman, in introducing the lecturer, said the subject was one of which he thought they heard a good deal, and he was sure it would be of great advantage to them to hear the opinion on the subject of Professor Knight.

Professor William Knight, who was cordially received, began by dealing with the subject historically. He said it was a mistake to suppose that the higher education of women had been exclusively or mainly a modern achievement. It was distinctively of modern interest, but they had evidence of the higher education and of many notable successes in philosophy, letters, and art amongst the women of the ancient world. Even in the fragements of early Indian literature women were introduced as taking part in philosophical discussions, but it was amongst the Geeeks that they found the most conspicuous results in this as in so many other directions. The manifoldness of the Hellenic culture would lead them to expect what they actually found—that there were women in Greece more highly cultured than any of whom they had authentic record in mediæval times. Throughout the middle ages they found the condition of women a sad chapter in their history. The shadow of mediævalism was darkest as it bore upon them. If in those times the education of men was slight, that of women was practically non-existent. It was hard to say, however, what might have happened had the Hellenic and Hebraic elements

blended at an earlier period. Modern history would have been very different from what it had been if the leaven of the East had passed over to the West and entered the European mind in a natural manner at the commencement of the Christian era. They knew little about the position of women in England at the commencement of our authentic history, but it was clear that in the early Celtic nation it was on the whole a degraded one. She was simply one of the household chattels, useful as a drudge, or useful to the tribe as its flocks and herds were useful. Its was not to the Celts but to the Saxons that they owed the germs of that regard for women which (when allied with later Teutonic and Norman elements) grew into a chivalrous devotion to them, which had become the parent of so many virtues in man. The Teutonic race, which overran the Celtic aborigines of Britain, showed a regard for the women of their tribes far in advance of anything they found in the most highly-civilised nations of antiquity. No doubt amongst the Hebrews, the Greeks, and the Romans there were exceptional instances of chivalry, of rare tenderness, and high-minded devotion, but that was not the same thing as the chivalry of the Saxon and the Teuton. The Saxon women possessed property and land, and they could transmit or bequeath it, while they often took part in the Witenagemot of the King's Council. Of course the great mass of the peasant women had plenty of hard work to perform, but the Saxon workwomen were not compelled to undergo servile toil, which the Celtic women underwent. In the schools established by Benedictines girls were taught, as well as boys, side by side in the Benedictine abbey, and a part of it was the school where women learned Latin if they chose. The Abbess Elfleda, of Whitby, and Eadburga, the Abbess of Minster, were correspondents of the most erudite men of their age, and their learning was as conspicuous as their charity and devotion were. As time went on the new elements blended with the old, and when they reached the thirteenth century they found a fresh type of chivalry evolved in England, and grafted in the old Saxon stem. When the strife between the Anglo Saxon and

the Norman ended new national characteristics arose out of the welding of the two races, and as one result they saw a different attitude towards women. What more immediately concerned them, however, was the education of the women of that period. At the convent schools, such as the Abbey, Barking, the priories of Clerkenwell, Halliwell, Kilburn, &c., female education was given not only to the nuns, or those destined to be nuns, but to all women of the noble houses and to those of the middle classes who desired it. It was a fact not generally known that in the middle ages women were not cut off from the higher education so much as they were after the Reformation. The records that survived of the educational methods employed at the close of the mediæval period and the commencement of the modern were very fragmentary. Some had supposed that in the sixteenth century a classical education was within the reach of English girls. It was true that there were some highly educated women in England then, but such instances as those of Lady Jane Grey and the Countess of Pembroke, for example, were instances of quite exceptional women exceptionally trained. After enumerating some works which had been written by learned women of the eighteenth century, the lecturer went on to deal with the question of education in America in the beginning of the nineteenth century, and of the number of colleges which had been opened for the conjoint education of man and woman. He then alluded to the opening of several schools of science in Ireland, and dealt with the question of the admission of women into these schools. In 1878 the University of London took the very momentous and decisive step of opening up all its examinations and degrees to women. It was a most significant act, and had been fruitful of good in many ways, reacting even on the educational institutions of America. In the following year Dr. Barnard, the president of Columbia College, N.Y., in his annual report to the College, advocated a similar opening up both of the classes and examinations of his College. But the question was left open, however, whether the students of both sexes should be admitted to the same lectures,

or whether an annexe should be established, where women were educated in different rooms from the male students. The question now arose as to whether the education of men and women was best carried on jointly or in separate colleges each by themselves. The advantages of mixed education were numerous and obvious. There was—First, the same standard of teaching and examination; second, the distinct economy of having only one staff of teachers; third, the stimulus of a healthful rivalry in learning between the sexes; and fourth, the greater likelihood that similar chances might open up to both in the after race of life. On the other hand, there were plain physiological difficulties arising out of differences in organisation and bodily strength that told the other way. It was for that reason he thought that, while mixed classes should remain the rule in the provincial colleges of the country, there would always be some women who preferred separate instruction in colleges of their own, and for whom education on the lines of Girton, Newnham, and the Oxford Halls was much better than anything they could learn in mixed classes could ever be. It must also be remembered, that the mixed system might develop an unhealthy as well as a healthy rivalry. If women began to think it one end of education to outstrip the other sex if possible in every line of effort immense evils would result, and a reaction hurtful to themselves must set in whenever the idea of rivalry became dominant. There should be some colleges exclusively for men, others exclusively for women, others mixed, and open to both, and others open indiscriminately to all. The differences which existed in our social strata necessitated differences in our educational methods as well as in our educational material. It was to be hoped that the recent successes in examinations, over which the whole educated world rejoiced, would not lead many to draw the illogical and extravagant conclusion that all spheres should be opened up to women. Such a result would first injure women themselves, and then react injuriously on men, for the gentler a woman was the more she despised an effeminate man, and the stronger a man was the more he disliked a masculine

woman. The only drawback to the higher education of woman was the risk of increasing their individualism, and in consequence their self-assertion. The purely communistic feeling, the sense of the organic unity of the race, the glory of living for great causes and sinking oneself in the advancement of such causes—those were not always fostered by opening up pathways to learning to which people might isolate themselves till they became the most learned of their age. In conclusion, he said he believed they were as yet on the threshold of triumph as to the education of women, because he believed the more thoroughly educated women were the more thoroughly improved and educated men would be, and therefore the more elevated and ennobled the future of the race would be. He was confident that the higher education of the woman would develop and evoke the virtues of chivalry, of courtesy, and of unselfishness in men, because he was sure of this, that the most-highly educated women, who were trained in knowledge, who became experts in language, philosophy, science, and art, would exert the highest and the deepest, and therefore the most benign. influence on the education of their sons and daughters, and consequently of the whole future of the world.

Dr. Redfern.—The thoroughly exhaustive account which has been given us of what has been done in all time, and especially of recent years, to promote the education of women prevents anything of importance being added. I was extremely glad to hear, what I dare say many of you knew, of the numerous successes of ladies in the Cambridge and London University examinations, examinations, I believe, of the very highest type in arts and science. Mention was also made of what has happened on this side too. Ladies have not unfrequently taken a very high—nay the very highest—place in particular subjects at the examinations of the Royal University. All its prizes and degrees are completely open to women, and have been taken with great advantage by large numbers of ladies, several of whom have altogether headed the men of their year. Something was said by the Professor on which I wish to say a

word as a physiologist. I was afraid when he drew your attention to a very patent physiological difference in the sexes that you might go away with the idea that this was disheartening to women. Though it happens that women are for the most part weaker, in our condition of society, than men, I know no Physiolgical reason why it should be so. I do not think it is so to the same extent with women over the world. It is not so in all women, even in this country, but what we do know is this, the sacrificing nature of women. They sacrifice themselves for their families or husbands, often taking little or no food, and saving most of it for their husbands when they come home. This is not likely to lead to health of body or strength of mind. If women regulated their diet, the times and quantity of it, their amusements and exercises, as men do, they would be much stronger than they are. You heard from the Professor his doubt, and I do not wonder at it, whether it is desirable that men and women should be taught together in joint classes. I think he put that very fairly before you. I know something of this matter in connection with the classes in the Queen's College here, and I am bound to say that in point of gentlemanly conduct, in point of reverence, and attention, no men in the world could possibly have distinguished themselves more highly than the men of the North of Ireland, when taught together with women in the classes of the Queen's College. I am sure you will join with me very heartily in proposing that our thanks be given to the learned Professor for having brought this subject so lucidly before us.

Miss Tod.—It would not be easy for me to express the pleasure which it gives me to second the vote of thanks. The beauty of the lecture to which we have listened is obvious to all. I wonder whether in looking up the history of the education of women, it has occurred to the Professor what an enormous amount of money, pains, and trouble women have spent upon the education of men. The history of the Oxford and Cambridge Universities is a remarkable proof of this. I have often thought that really in that respect, purely from a monetary point of

view, men do owe a little monetary help to the higher education of women. Referring to the names of the distinguished ladies who were pioneers of education, I may mention that there was in Belfast a lady—Mrs. Elizabeth Hamilton—who in the year 1800 published a book on the education of women, which is worth reading, for its practical hints, to-day. It is true that she lived a great deal in Scotland, nevertheless she was a Belfast woman, and though Belfast was a very small place in those days, not one of us could possibly use stronger language, or claim a higher place for women than she did. I have been thinking also of the immense strides this question has made since I first attended some of the meetings held in this room on the subject of higher education. I may say that the Queen's University was only a few months behind Cambridge in founding local examinations for women. It was in this very room that the first year's examinations were held. Last year as one of the Englishwomen's Committee of Education for the Chicago Exhibition, I had occasion to make a complete collection of reports, &c., connected with the education of girls in Ireland, to send out there; from these I found that we had a more complete state-aided system than exists in either England or Scotland. It is perfectly true that we have nothing like the same amount of money, but a more complete system. The National system provides an elementary education all over the country, and the intermediate system has given an immense lift to the secondary education of boys and girls. It is under state supervision and state sanction, and then the Royal University is as open to women as to men. I think that we ought not here to overlook the immense work which has been done by one lady —Mrs. Byers—in creating by her own brains the Victoria College, from which a very considerable number of graduates of the Royal University have come. It is with the greatest possible pleasure that I second the vote of thanks.

Mr. Milligan.—I think the Irish Celts must be excepted from what the learned Professor has stated. At a very early period women had equal rights with men as to the inheritance of land

in Ireland. It was an Ulster woman who first got this privilege for her sex, and thus secured women's rights as far as the inheritance of land was concerned. This lady was the daughter of the Chief Poet of Ulster. Up to her time women could not inherit land ; if a father died without sons the land went to the nearest male relative. She succeeded in getting this law repealed, and afterwards women had equal rights with men to inheritance of land.

Mr. Martin.—During my own vacation some little time ago, I heard a great deal about the position of the lecturer of this evening, and the interest he has taken in regard to the education of women. I heard that his lecture on that subject had accomplished a great deal of good in Scotland and England, and it occurred to me that I might utilse a little leisure by seeking an interview with our lecturer, which I did, and try to persuade him to come over here and give us the benefit of his experience. He is really the leading authority in regard to this question. The only objection I have to his views is this, I think that the educators of women and the wise men would do a great deal of good to society provided they advanced just a little farther. I should like to see our women getting their place in the Universities as fully as the men, and be at liberty to record their opinions by vote. I do hope that this is only the first of a little series of lectures that we may have in this city from this very emiment educationalist.

Professor FitzGerald.—I don't think I need say anything in addition to putting the vote of thanks proposed by Dr. Redfern and supported by Miss Tod, Mr. Gray, and Mr. Martin. It seems to me that the information given us is of extremely great value, because the study of the history of women's higher education shows that many of those terrible consequences which have often been anticipated have not ensued in past times, and we are therefore justified in concluding that they are not likely to ensue in any future time. One might take many of the Professor's lectures as texts, and, as he says, expand them to a much greater length, but from want of time and information on

my own part I shall refrain from attempting to make any crude remarks on the subject, and will simply convey to Professor Knight our very heartfelt thanks for the lecture given us.

PROFESSOR KNIGHT.—I sincerely thank you for the vote. It has been a great pleasure to me to be here. It is a favourite motto of my life that "it is more blessed to give than to receive." I think to-night, in the speeches which have followed, that I have received as much as I have given. I have learned a great many new things of which I was only partly informed. With reference to the remarks that fell from Mr. Martin, I have the utmost sympathy with women having those higher privileges, not merely voting, but teaching in the University. I would hail the day when University professorships would be open to women I do not see anything to prevent that. I should like to see the experts of the female sex, who are more compent to teach some subjects than we are, installed as University lecturers or professors of those subjects. I have only glanced at the fringe of this great question to-night, and I thank you most cordially for the interest you have taken in my remarks. If it is possible for me in the future to again visit this delightful city, it will certainly give me very great pleasure.

BELFAST

Natural History & Philosophical Society.

Officers and Council of Management for 1894-95.

President :

ROBERT LLOYD PATTERSON, Esq., J.P., F.L.S.

Vice-Presidents :

JOHN BROWN, Esq.

L. M. EWART, Esq., J.P., M.R.I.A.

WM. SWANSTON, Esq., F.G.S.

JOSEPH WRIGHT, Esq., F.G.S.

Hon. Treasurer :

JOHN BROWN, Esq.

Hon. Librarian :

THOMAS WORKMAN, Esq., J.P.

Hon. Secretary :

ROBERT M. YOUNG, Esq., B.A., M.R.I.A.

Council :

JOHN BROWN, Esq.
PROFESSOR J. D. EVERETT, F.R.S.
LAVENS M. EWART, Esq., J.P., M.R.I.A.
PROFESSOR M. F. FITZGERALD, B.A., M.I.M.E.
JOHN H. GREENHILL, Esq., Mus.Bac.
JOHN HORNER, Esq.
JAMES A. LINDSAY, Esq., M.D., M.R.C.P., Lond.
R. LLOYD PATTERSON, Esq., J.P., F.L.S.
WM. H. PATTERSON, Esq., M.R.I.A.
WM. SWANSTON, Esq., F.G.S.
JAMES WILSON, Esq., M.E.
THOMAS WORKMAN, Esq., J.P.
ROBERT YOUNG, Esq., J.P., C.E.
JOSEPH WRIGHT, Esq., F.G.S
R. M. YOUNG, Esq., B.A., M.R.I.A.

SHAREHOLDERS

[*Denotes holders of three or more Shares.]

*Alexander, Francis, B.E., Great Victoria Street,	Belfast.
Allworthy, Edward, Mosaphir,	do.
Anderson, John, J.P., F.G.S., East Hillbrook,	Holywood.
Andrew, John J., L.D.S., R.C.S. Eng., Belgravia,	Belfast.
Andrews, Miss Elizabeth, College Gardens,	do.
Andrews, George, J.P., Ardoyne,	do.
Andrews, Samuel, J.P.,	London.
Armstrong, Thomas, jun., Donegall Square West,	Belfast.
Barbour, James, J.P., Ardville, Marino,	Holywood.
Beattie, Rev. A. Hamilton,	Portglenone.
Bigger, Francis J., Ardrie, Antrim Road,	Belfast.
Black, Charles W., Glen Ebor, Strandtown,	do.
Bland, Robert H., J.P.,	Lisburn.
Bottomley, Henry H., Salisbury Avenue,	Belfast.
Boyd, William, Great Victoria Street,	do.
Boyd, William Sinclair, Ravenscroft, Bloomfield,	do.
Braddell, Edward, The Limes, Malone Park,	do.
Brett, Charles H., Gretten Villa South, Malone Road,	do.
Brett, John H., C.E., Fortwilliam Park,	do.
Bristow, James R., Henry Street,	Dublin.
Brown, John, Edenderry House,	Belfast.
Brown, William K. (Representatives of), Rushmere,	do.
Bulloch, Alexander, Eversleigh,	do.
Burden, Henry, M.D., M.R.I.A. (Representatives of),	do.
Burnett, John R., Rostellan, Malone Road,	do.
Byers, John W., M.A., M.D., University Road,	do.
Calwell, Alex. M'D.,	do.
Calwell, William, M.A., M.D., College Square North,	do.
*Campbell, Miss Anna, Windsor Avenue,	do.

Campbell, John, College Gardens, Belfast.
Carlisle, A.M., Elmwood House, do.
Carr, A. H. R., Skipper Street, do.
Carson, John, Walmer Terrace, Holywood.
*Charley, Phineas H., Bangor, Co. Down.
Clarke, George H., J.P., Roseville, Lisburn.
Clark, George S., Dunlambert, Belfast.
Coates, Victor, J.P., Rathmore, Dunmurry.
Connor, Charles C., M.A., M.P., Nottinghill House, Belfast.
Cowan, P. C, College Gardens, do.
Crawford, William, Mount Randal, do.
Crawford, William, Calendar Street, do.
Cuming, Professor James, M.A., M.D., Wellington Place, do.
Cunningham, Professor Robert O., M.D., F.L.S., F.G.S., Montpellier, Malone Road, do.

Davies, John H., Glenmore Cottage, do.
*Deramore, Lord, D.L. (Representatives of), Newtownbreda.
Dods, Robert, B.A., Dunluce Terrace, Belfast.
*Donegall, Marquis of, do.
*Downshire, Marquis of, The Castle, Hillsborough.
Drennan, W. H. Fountain Street, Belfast.
Dudley, Rev. Freeman, B.A., The Rectory, Kilkeel.
Duffin, Adam, LL.D., University Square, Belfast.
Dunleath, Lord, Ballywalter Park, Ballywalter.

Everett, Professor Joseph D., M.A., D.C.L., F.R.S., Derryvolgie Avenue, Belfast.
Ewart, G. Herbert, Firmount, Antrim Road, do.
Ewart, Lavens M., J.P., M.R.I.A., Glenbank House, do.
Ewart, Sir Wm. Quartus, Bart., J.P., Glenmachan House, do.

Fagan, John, F.R.C.S.I., Great Victoria Street, do.
*Fenton Francis G., Ligoniel.
Ferguson, Godfrey W., Donegall Park, Belfast.
Finlay, Robert H. F., Hughenden Avenue, do.
Finlay, William Laird, J.P., St. Clair, Windsor, do.

FitzGerald, Professor Maurice F., B.A., M.I.M.E., Assoc., M.I.C.E., Belfast.

*Getty, Edmund (Representatives of), do.
Gibson, Andrew, Cliftonville Avenue, do.
Girdwood, Catherine, Mountpleasant, do.
Gordon, Robert W., J.P., Fortwilliam, do.
*Grainger, Rev. Canon, D.D., M.R.I.A. (Representatives of), Broughshane.
Gray, William, M.R.I.A., Mountcharles, Belfast.
Greenhill, John H., Mus. Bac., Fortwilliam Park, do.
Greer, Thomas, J.P., M.R.I.A., Seapark, Carrickfergus.

*Hall, Frederick H., Messrs, R. & H. Hall, Waterford.
*Hamilton, Hill, J.P. (Representatives of), Belfast.
Harland, Sir E. J, Bart., J.P., M.P., Baroda House, Kensington Palace Gardens, London.
Heburn, William, College Gardens, Belfast.
Henderson, Miss Anna S. (Representatives of), Eglantine Terrace, do.
Henderson, James, A.M., Oakley, Windsor Avenue, do.
Henderson, Robert, Piccadilly, London.
Herdman, John, J.P., Carricklee House, Strabane.
*Herdman, Robert Ernest, Belfast.
Heyn, James A. M., Strandtown House, Cultra.
Hind, John, jun., Clifton Park Avenue, Belfast.
Hodges, Professor John F., M.D., F.C.S., F.I.C., J.P., Sandringham, Belfast.
Hogg, John, Academy Street, do.
*Houston, John Blakiston, J.P., V.L., Orangefield, do.
*Hughes, Edwin, Mertoun, Holywood.
Hyndman, Hugh, LL.D., Ardenlee, Ravenhill Road, Belfast.

Inglis, James, J.P., Abbeyville, Whiteabbey.

Jackson, A. T., C.E., Tighnabruaich, Derryvolgie Avenue, Belfast.
Jaffé, Alfred, J.P., Cloona, Dunmurry.

Jaffé, Otto, Kin Edar, Strandtown, Belfast.
Johnston, Samuel A., J.P., Dalriada, Whiteabbey.

Keegan, John J., J.P. (Representatives of), Holywood.
Kennedy, James, J.P., Richmond Lodge, Belfast.
Kennedy, William, Kenbella House, do.
Kertland, Edwin H., Malone House, do.
Kidd, George, J.P.. Lisnatore, Dunmurry.
*Kinghan, Rev. John, Altoona, Windsor, Belfast.
Kyle, Robert Alexander, Cliftonville, do.

Lanyon, John, C.E., Lisbreen, Fortwilliam Park, do.
Larmor, Joseph, M.A., St. John's College, Cambridge.
Leathem, John G., Victoria Gardens, Windsor Park, Belfast.
Lemon, Archibald Dunlap, J.P., Edgecumbe, Strandtown, do.
Lepper, F. R., Elsinore, Carnalea, Co. Down.
Letts, Professor E. A., Ph.D., F.C.S., Avonmore, Craigavad.
Lindsay, James A., M.A., M.D., Victoria Place, Belfast.
Lytle, David B., J.P., Bloomfield House, do.
Lytle, Joseph H., J.P., Ashleigh, Windsor Avenue, do.

Macassey, L. Livingstone, B.L., M.I.C.E., Stanley House, Holywood.
Macfarlane, John, Mountcharles, Belfast.
Mackenzie, John, C.E., Strathavon, Lisburn Road, do.
*Macrory, A. J. (Representatives of), do.
Magill, J. E. Easton Terrace, Cliftonville, do.
Malcolm, Bowman, Ashley Park, Antrim Road, do.
Maxton, James, The Elms, Strandtown.
Maxwell, David A., College Gardens, Belfast.
Milligan, Seaton Forest, M.R.I.A., Greenwood, Antrim Road, do.
Mitchell, W. C., J.P., Dunderave, Strandtown.
Montgomery, Henry C., Newton Lodge, Newtownbreda.
Montgomery, H. H., Brazil Cottage, Knock, Belfast.
Montgomery, Thomas, J.P., Ballydrain House, Dunmurry.

Moore, James, The Finaghy,	Belfast.
Mullan, William, Lindisfarne, Marlborough Park,	do.
Murney, Henry, M.D., J.P., Tudor House,	Holywood.
*Murphy, Isaac James,	Armagh.
*Murphy, Joseph John, Osborne Park (Reps. of),	Belfast.
Murray, Robert Wallace, J.P., Fortwilliam,	do.
Musgrave, Edgar, Drumglass, Malone,	do.
*Musgrave, Henry, Drumglass, Malone,	do.
Musgrave, James, J.P., Drumglass, Malone,	do.
MacAdam, Robert, Great Victoria Street,	do.
M'Bride, Henry James, Glenalina,	do.
M'Bride, Samuel, Westbourne, Windsor,	do.
*M'Calmont, Robert (Representatives of),	London.
*M'Cammon, Thomas A., Dawson Street,	Dublin.
M'Cance, H. J., J.P., D.L., Larkfield,	Dunmurry.
M'Clure, Sir Thomas, Bart., J.P., D.L. (Reps. of),	
MacColl, Hector, Saxonia, Strandtown,	Belfast.
MacCormac, John, M.D., Victoria Place,	do.
M'Cormick, Hugh M'Neile, Ardmara,	Craigavad.
*M'Cracken, Francis (Representatives of),	
M'Gee, James, Woodville,	Holywood.
M'Gee, Samuel Mackey, University Street,	Belfast.
MacIlwaine, John H., Brandon Villa, Strandtown,	do.
*MacLaine, Alexander, J.P., Queen's Elms,	do.
M'Neill, George, Beechleigh, Malone Road,	do.
Neill, Sharman D., Wellington Park	do.
Nicholson, Henry J., West Elmwood,	do.
O'Neill, James, M.A., College Square East,	do.
*O.Rorke, Ambrose Howard, Tinnamara,	Greenisland.
Park, Rev. William, M.A., Fortwilliam Park,	Belfast.
Patterson, Edward Forbes, Penrhyn, Strandtown,	do.
Patterson, Mrs. Isabelle, Clanbrassil Terrace,	Holywood.
Patterson, Richard, J.P., Kilmore,	do.
*Patterson, Robert Lloyd, J.P., F.L.S., Croft House,	do.

Patterson, Robert, Tile Cote, Malone Road, Belfast.
Patterson, William H., M.R.I.A., Garranard, do.
Patterson, William R., College Park East, do.
Pim, Edward W., Elmwood Terrace, do.
Pim, Joshua, Slieve-na-Failthe, Whiteabbey.
*Pirrie, Elizabeth, Belfast,
Pooler, Rev. L. A., B.A., Lake Cottage, Downpatrick.
Praeger, Robt. Lloyd, B.E., M.R.I.A., National Library, Dublin.
Purser, Prof. John, LL.D., M.R.I.A., Queen's College, Belfast.

Rea, John Henry, M.D., Shaftesbury Square, do.
Rea, William R., Gardha, Fortwilliam Park, do.
Reade, Robert H., J.P., Wilmount, Dunmurry.
Riddel, William, J.P., Beechmount, Belfast.
Robertson, William, J.P., Netherleigh, Strandtown, do.
Robinson, John, St. James's Crescent, do.

Scott, R. Taylor, Richmond Villa, Derryvolgie Avenue, do.
Sheldon, Charles, M.A., D.Lit., B.Sc., Royal Acad. Institution, do.
Shillington, Thomas Foulkes, Dromart, Antrim Road, do.
Simms, Felix Booth, Prospect Terrace, do.
Sinclair, Thomas, M.A., J.P., Hopefield, do.
Sinclair, Prof. Thomas, M.D., F.R.C.S.Eng., Howard St., do.
Smith, John, Castleton Terrace, do.
Smyth, John, M.A., C.E., Milltown, Banbridge.
Speers, Adam, B.Sc., Riversdale, Holywood.
Steen, Robert, Ph.D., Dunedin, Malone Road, Belfast.
Steen, William, B.L., Northern Bank, Victoria Street, do.
Stelfox, James, Oakleigh, Ormeau Park, do.
Swanston, William, F.G.S., Cliftonville Avenue, do.

*Tennent, Robert (Representatives of), Rushpark do.
*Tennent, Robert James (Representatives of), Rushpark, do.
Thompson, E. M'C., Waring Street, do.
*Thompson, James, J.P., Macedon, Whiteabbey.
Torrens, Mrs. Sarah H., Edenmore (Reps. of), do

*Turnley, John (Representatives of),	Belfast.
Valentine, G. F., Sandhurst, Knock,	do.
Walkington, Mrs., Thornhill, Malone,	do.
Walkington, Thomas R., Edenvale, Strandtown,	do.
Wallace, John, Chlorine Gardens, Malone Road,	do.
Ward, Francis D., J.P., M.R.I.A., Wyncroft, Adelaide Park	do.
Ward, Isaac, Lisburn Road,	do.
Ward, John, J.P., Lennoxvale, Malone Road,	do
*Webb, Richard T., Milecross House,	Newtownards.
Whitla, Prof. William, M.D., J.P., College Sq. North,	Belfast.
Wilson, James, M.E., Oldforge,	Dunmurry.
Wilson, John K , Inch Marto, Marlborough Park,	Belfast.
Wilson, Walter H., Strandmillis House,	do.
Wilson, W. Perceval,	do.
Wolff, G. W., M.P., The Den, Strandtown,	do.
Workman, Francis, College Gardens,	do.
Workman, John, J.P., Lismore, Windsor,	do.
Workman, Rev. Robert, M.A., Rubane House,	Glastry.
Workman, Rev. Robert, B.D., The Manse,	Newtownbreda.
Workman, R. D. The Manse,	do.
*Workman, Thomas, J.P., Fairholme,	Craigavad.
Workman, William, Nottinghill,	Belfast.
Wright, James, Lauriston, Derryvolgie Avenue,	do.
Wright, Joseph, F.G.S., Alfred Street,	do.
Young, Robert, C.E., Rathvarna,	do.
*Young, Robert Magill, B.A., Rathvarna,	do.

HONORARY ASSOCIATES.

Gray, William, M.R.I.A., Mountcharles,	Belfast.
Stewart, Samuel Alex., F.B.S.Edin., Belfast Museum,	do.
Swanston, William, F.G.S., Cliftonville Avenue,	do.

Tate, Prof. Ralph, F.G.S., F.L.S., Adelaide, South Australia.
Wright, Joseph, F.G.S., Alfred Street, Belfast.

ANNUAL SUBSCRIBERS OF TWO GUINEAS.

Belfast Banking Company, Ltd., Belfast.
Northern Banking Company, Ltd., do.
Ulster Bank, Ltd., do.
York Street Spinning Company, Ltd., do.

ANNUAL SUBSCRIBERS OF ONE GUINEA.

Allen, C. E., Stormount Castle, Dundonald.
Armstrong, William, Fortwilliam Terrace, Belfast.
Barnett, R. M., M D., M.R.C.S.Eng., Pakenham Place, do.
Barr, James, Beechleigh, Windsor Park, do.
Barton, H. D. M., The Bush, Antrim.
Boyd, John, Southview Villas, Strandtown, Belfast.
Brown, G. Herbert, J.P., Tordeevra, Helen's Bay.
Bruce, James, D.L., J.P., Thorndale House, Belfast.
Carr, James, Rathowen, Windsor, do.
Craig, James, J.P., Craigavon, Strandtown, do.
Crawford, F. H., Chlorine House, Malone Road, do.
Davidson, S. C., Killaire House, Crawfordsburn.
Davies, A. C., Glenmore Cottage, Lisburn.
Dunville, Robert G., J.P., D.L., Redburn, Holywood.
Foster, Thos. A., Clonsilla, Antrim Road, Belfast.
Gamble, James, Royal Terrace, do.
Glass, James, J.P., Carradarragh, Windsor, do.
Green, Isaac, Ann Street, do.
Hanna, J. A., Marietta, Knock, do.
Hassan, Thomas, Strangemore House, do.
Hazelton, W. D., Cliftonville, do.
Higginbotham, Granby, Wellington Park, do.
Horner, John, Mount Clifton, Cliftonville, do.

Johnston, James, Joy Dene, Antrim Road,	do.
Jones, A. L., Waring Street,	do.
Kelly, W. Redfern, M.I.C.E., F.R.A.S., Dalriada, Malone Park,	do.
Lynn, William H., Crumlin Terrace,	do.
Malone, John, Brookvale House, Cliftonville,	do.
Matier, Alexander S., Northleigh, Fortwilliam Park,	do.
Milligen, John, Clonavor, Strandtown,	do.
Mull, Henry, Bedford Street,	do.
Murdoch, James, Ponsonby Avenue,	do.
M'Causland, William, Cherryvale House,	do.
M'Kee, William S., Fleetwood Street,	do.
M'Laughlin, W. H., Brookville House,	do.
Nesbitt, Courtney, Kinnaird Terrace,	do.
Paul, Thomas, Redcot, Knock,	do.
Raynor, Thomas, M.I.C.E., Brunswick Terrace,	Bangor.
Redfern, Prof. Peter, M.D., F.R.C.S.I., Lower Crescent,	Belfast.
Ross, Wm. A., Iva Craig,	Craigavad.
Scott, Conway, C.E., Annaville, Windsor Avenue,	Belfast.
Swiney, J. H H., Chichester Avenue,	do.
Tate, Alexander, C.E., Longwood, Whitehouse,	do.
Taylor, Sir David, Bertha, Windsor,	do.
Thompson, John, Limestone Road,	do.
Turpin, James, Waring Street,	do.
Walkington, R. B., Carriggorm,	Helen's Bay.
Wise, Berkeley D., C.E., Silverstream House,	Greenisland.
Withers, James, Lawrence Street,	Belfast.

Report and Proceedings

OF THE

BELFAST

NATURAL HISTORY & PHILOSOPHICAL SOCIETY

FOR THE

SESSION 1894-95.

BELFAST:
PRINTED BY ALEXR. MAYNE & BOYD, 2 CORPORATION STREET
(PRINTERS TO QUEEN'S COLLEGE.)

1895.

CONTENTS.

Belfast Natural History and Philosophical Society.

ESTABLISHED 1821.

SHAREHOLDERS.

1 Share in the Society		costs £7.
2 Shares	,,	cost £14.
3 Shares	,,	cost £21.

The proprietor of 1 Share pays 10s. per annum; the proprietor of 2 Shares pays 5s. per annum; the proprietor of 3 or more Shares stands exempt from further payment.

Shareholders are only eligible for election on the Council of Management.

MEMBERS.

There are two classes—Ordinary Members, who are expected to read papers, and Visiting Members, who, by joining under the latter title, are understood to intimate that they do not wish to read Papers. The Session for Lectures extends from November in one year till May in the succeeding one. Members, Ordinary or Visiting, pay £1 1s. per annum, due 1st November in each year.

Each Shareholder and Member has the right of personal attendance at all meetings of the Society, and of admitting a friend thereto; also of access to the Museum and Library for himself and family, with the privilege of granting admission orders for inspecting the collections for any friend not residing in Belfast.

Any further information can be obtained by application to the Secretary. It is requested that all accounts due by the Society be sent to the Treasurer.

The Museum, College Square North, is open daily from 10 till 4 o'clock. Admission for Strangers, 6d. each. The Curator is in constant attendance, and will take charge of any Donation kindly left for the Museum or Library.

Belfast Natural History and Philosophical Society.

ANNUAL REPORT, 1894.

The Annual Meeting of the Shareholders was held in the Museum, College Square North, on 25th July, "to receive the Council's report for the past twelve months, along with the Treasurer's Statement of Accounts; to elect five members to the Council of Management for 1895-96, in the place of five who retire and are eligible for re-election; and to transact such other business as may be brought forward pertaining to an annual meeting." Mr. R. Lloyd Patterson, J.P., F.L.S., presided, and the attendance included Messrs. W. H. Patterson, Isaac Ward, Robert M. Young, B.A., Secretary; George Kidd, J.P.; J. H. Greenhill, James O'Neill, M.A.; R. A. Kyle, E. Forbes Patterson, T. F. Shillington, and Drs. John MacCormac and Calwell.

The Hon. Secretary (Mr. R. M. Young) read the notice convening the meeting, and submitted the annual report as follows:—"The Council of the Belfast Natural History and Philosophical Society desire to submit their report of the working of the Society during the past year. The winter session was opened in the Museum, College Square, on 13th November, 1894, when the President of the Society (Mr. Robert Lloyd Patterson, F.L.S.) delivered an inaugural address. The second meeting was held on 27th November, 1894, when a lecture was kindly delivered by Rev. W. S. Greene, M.A., Her Majesty's inspector of fisheries—subject, 'Sea Fish and Fishing off the West of Ireland,' illustrated by a specially prepared series of lantern slides. The third meeting was held on 4th

December, 1894, when the following papers were read :—1, by Mr. John Brown, 'Electrolytic Crystallisation of Metals ;' 2, by Mr. A. S. Cleaver, B.A., 'Through the Hot Lake District of New Zealand.' At the fourth meeting, held on 8th January, 1895, on the proposal of the President, a vote of condolence was passed to the relatives of the late Mr. Robert S. MacAdam, and the Hon. Secretary (Mr. R. M. Young, B.A.) gave a brief description of two Irish sepulchral urns recently presented to the Museum. An illustrated lecture entitled 'Old Belfast,' prepared by Mr. John J. Marshall, was then read by Mr. W. Gray, M.R.I.A., the photo slides being shown by Messrs. Marshall and Allen. The fifth meeting was held on 5th February, 1895, when two papers were read—1, by Dr. John MacCormac, on 'Education and Innervation,' illustrated by a special series of lantern photo slides ; 2, by Mr. Seaton F. Milligan, M.R.I.A., Vice-President R.S.A.I., on 'Antiquarian Collections in Ulster.' The sixth meeting was held on 5th March, 1895, when a lecture was kindly delivered by Mr. W. Redfern Kelly, M.I.C.E., F.R.A.S.—subject, 'The Great Mystery of Stellar and Planetary Evolution.' The seventh meeting was held on 2nd April, 1895, when a lecture was given by Mr. James Wilson, M.E.—subject, 'The Alps, with Rope and Axe,' illustrated by a fine series of lantern views, taken by the lecturer. All the above meetings were largely attended, some of them inconveniently so, by members of the Society and their friends. In the last annual report reference was made to the fact that your Council had been able to secure a course of Gilchrist lectures for the city, and the hope was expressed 'that this action would be fully justified by the success of the series in Belfast and other Ulster towns.' This expectation has been more than realised by the unqualified success of these lectures, which were delivered at intervals of a fortnight during the last four months of 1894, by Professor Lewes, Sir R. S. Ball, Rev. W. H. Dallinger, Dr. Roberts, Professor Laurie, and Dr. A. Wilson. Sir Robert Ball's lecture in the Ulster Hall, at which the chair was taken by your President, was listened to by an

overflowing audience. Your Council considered that it would be unwise, in view of the Gilchrist lectures, to hold the usual series of popular scientific lectures, but trust that they may be resumed next session.

It will be observed from the balance sheet of the Society, which has been drawn up by the Hon. Treasurer in accordance with the requirements of the Local Government Board and duly audited by the official auditor, that the financial condition of the Society and Museum continues fairly satisfactory. The additional rooms acquired by the Belfast Naturalists' Field Club have been fitted up, and are now in their occupation. The large lecture hall was rented for a series of lectures by the Belfast Society for Extension of University Teaching, and, as in former years, the rooms in the Museum have been used for the holding of a number of meetings of local scientific societies. Since the last annual meeting your Society has to deplore the loss of one of their oldest and most valued members, the late Robert S. MacAdam, best known as the former editor of the *Ulster Journal of Archæology*. As already mentioned, a vote of condolence was passed to his relatives at the first meeting after his decease, and was duly and appreciatively acknowledged by them. The Museum was opened on Easter Monday and Tuesday at the usual nominal charge, and large numbers of the public availed themselves of the privilege, though, owing to counter attractions, particularly the Exhibition, the visitors to the Museum were scarcely up to the average. The Curator continues to discharge his duties to the full satisfaction of your Council, and, his former assistant having resigned, John Sinclair has been appointed as his successor. A list of donations to the Museum, and of publications received in exchange from home and foreign societies, will be printed with the present report. Among the recent additions to the Museum are two oil portraits which are specially noteworthy. They were presented to the Society at the first meeting of the winter session, and were described in the President's inaugural address. One is a half-length portrait of the late William Thompson, for many years

President of the Society, author of the 'Natural History of Ireland.' This valuable work of art was bequeathed by his sister, the late Miss Jane Thompson. The other is an excellent likeness of the late Robert Patterson, F.R.S., author of 'Zoology for Schools' and several other works, one of the founders of the Society, and for various and lengthened periods its president. This was presented by his son, our present President. To these have since been added a portrait in oil of the late Robert S. MacAdam, presented by his cousin, Miss Anna MacAdam, together with a selection of his books. Amongst the miscellaneous objects recently acquired may be mentioned the perfectly preserved head of a soldier killed in 1798. It was found in a peat bog near Dungannon. The Council desire, on behalf of the Society, to thank the local press for their admirable reports of our public meetings. This meeting will be asked to elect five members of Council in place of the gentlemen who retire in accordance with the new constitution, and who are eligible for re-election."

Mr. Brown (Treasurer) submitted the annual financial statement, which showed that there is a balance on hands of £11.

The Chairman, in moving the adoption of the report, referred to its leading features, and said he knew there were some gentlemen there that day at some inconvenience. He would therefore not detain them more than was absolutely necessary. The meeting was held later than usual owing to circumstances more or less unavoidable. It would be their endeavour to hold their annual meeting nearer to the working session. He did not recollect any occasion on which they met so late as the last week in July. He begged to move the adoption of the report.

Mr. Shillington, in seconding the motion, referred to the satisfactory nature of the report. He thought the Society was to be congratulated on two or three things, especially on the bringing of the Gilchrist lecturers to Belfast during the year, and he hoped now, that that movement had been inaugurated, they would be the means of bringing popular lecturers to Belfast. He did not think they had any reason to be disheartened at the

results of Easter Monday's visits. The Exhibition was just opened at that time.

The report was adopted.

Mr. Young read the following as the list of donations to the Museum in 1894-95 :—From Robert Patterson, Esq., Malone Park, specimens of a large balanus (*Diademia coronula*); Robert MacAdam, Esq., a number of fossils and shells ; Directors of the Belfast Commercial Buildings, ancient leaden trunk-head of a spout from a house in Bridge Street, taken down in 1894 ; Miss S. M. Thompson, Macedon, Whitehouse, rock specimens from County Donegal ; James Thompson, Esq., J.P., Macedon, Whitehouse, a portfolio of lithograph portraits, by Hanhart, of the leading scientists assembled at Ipswich meeting of the British Association in 1851 ; W. H. M'Laughlin, Esq., Brookfield House, Belfast, specimens of fossil coral (*Lithostrotian basaltiforme*) from Armagh ; Edward M'Connell, Esq., a specimen of syenite from Rostrevor ; Robert Corry, Esq., Sandown, The Knock, a sepulchral urn dug up at Knock in 1894 ; the Misses Crawford, College Green, Belfast, a lady's richly embroidered spencer of the period of Queen Anne, made at Carrickfergus; the late Miss Jane Thompson, Dublin, per James Thompson, Esq., J.P., Macedon, Whitehouse, a large portrait in oil of her brother, the late William Thompson, author of the "Natural History of Ireland" ; Robert Lloyd Patterson, Esq., F.L.S., J.P., portrait in oil of the late Robert Patterson, F.R.S., author of "Zoology for Schools," and one of the founders of the Society; W. Swanston, Esq., F.G.S., a bust of Professor Edward Forbes, F.R.S.; Miss MacAdam, portrait in oil of the late Robert M'Adam, formerly editor of the *Ulster Journal of Archæology* ; the Corporation of the City of London, two medals struck in commemoration of the marriage of the Duke of York and the visit of the King of Denmark ; Mrs. Hewitt, specimen of a large butterfly *(Papilio luna)* from Michigan; Miss Hyndman, Ardenlee, Belfast, a box of small medallions.

Dr. MacCormac moved a vote of thanks to the donors to the Museum, and also to their estimable Honorary Secretary, Mr.

Young. Why did he ask their liberty to do that? It was because he was fully aware of the valuable services rendered by Mr. Young, and of Mr. Young's indefatigability, kindness, and gentlemanly conduct at all times. He had much satisfaction in proposing that the best thanks of that meeting be given to Mr. Young.

Mr. GREENHILL seconded the motion, which was passed.

Mr. GEORGE KIDD, J.P., then moved a vote of thanks to the chairman, referring to the indebtedness of the organisation to Mr. Patterson's father and to himself.

Mr. O'NEILL seconded the motion, which was carried by acclamation.

The PRESIDENT said it was a source of pleasure to continue to be closely identified with the institution of which his father was one of the parents, and of which he was so proud.

The Committee was re-elected, and the following were chosen office-bearers for the ensuing year:—President, R. Lloyd Patterson, J.P.; Vice Presidents, John Brown, W. Swanston, Dr. J. A. Lindsay, and Professsor FitzGerald; Hon. Treasurer, John Brown; Librarian, T. Workman; Hon. Secretary, R. M. Young.

The meeting then terminated.

EDUCATIONAL ENDOWMENTS (IRELAND) ACT, 1885, 48 & 49 Vict., ch. 78.

The Account of the Council of the Belfast Natural History and Philosophical Society for the year ended 30th April, 1895.

Dr. — **Cr.**

CHARGE.

	£	s.	d.	£	s.	d.
To Balance as per last Account				£10	2	2
,, Amount of Subscriptions received in the year ended 30th April, 1895				134	1	0
,, Amount of Dividends received in the year ended 30th April, 1895				17	8	5
,, Amount of Rents received in the year ended 30th April, 1895				43	5	6
,, Amount of Fees received in the year ended 30th April, 1895				0	4	0
,, Amount of Miscellaneous Receipts in the year ended 30th April, 1895 (not included in the foregoing), viz.:—						
Entrance fees at door on Easter Monday	£22	1	8			
Do. do. Tuesday	4	11	2			
Do. do. from May 1, '94, to date	18	15	3			
				45	8	1
Total				£250	9	2

DISCHARGE.

	£	s.	d.	£	s.	d.
By Amount of Payments made in the year ended 30th April, 1895, under the following headings—						
Maintenance of Premises, &c. ...	£26	17	1			
Rent and Taxes, &c.	27	11	0			
Salaries	90	9	3			
				£144	17	4
Other Payments, viz.:—						
Printing and Stationery	13	1	7			
Advertising	13	3	4			
Postage and Carriage	8	19	1			
Fuel and Gas	17	1	4			
Subscriptions to Museum's Association	1	1	0			
Insurance...	10	11	6			
Auditor's Fee	1	1	0			
Cheque Book	0	4	2			
Printing Report	18	11	4			
Subscription to Ulster Journal of Archaeology	0	5	0			
Rev. W. S. Green's Travelling Expenses	1	14	4			
Expeuses at Easter	8	10	1			
				94	3	9
Total Payment				£239	1	1
,, Balance in favour of this Account on the 30th April, 1895				11	8	1
Total				£250	9	2

N.B.—Besides the above Balance there is a sum of £400 standing to the credit of this Account in the York Street Spinning Co., Ltd., 4½ per cent. Debenture Stock.

We certify that the above is a true Account.

R. LLOYD PATTERSON, Governor.
J. BROWN, Accounting Officer.

Dated this 21st day of May, 1895.

I certify that the foregoing Account is correct.

J. F. MAYNE, Auditor.
18th day of June, 1895.

DONATIONS TO THE MUSEUM, 1894-95

From W. Swanston, Esq., F.G.S.

A bust of the late Professor Edward Forbes, F.R.S.

From James Thompson, Esq., J.P.

Portfolio of lithograph portraits, by Hanhart, of the leading scientists assembled at the Ipswich meeting of the British Association in 1851.

From Robert Patterson, Esq.

Specimen of a large balanus (*Coronula diadema*).

From Robert MacAdam, Esq.

A number of fossils and shells.

From The Directors of the Belfast Commercial Buildings.

Ancient leaden trunk-head from the front of a house in Bridge Street, taken down in 1894.

From Miss Sydney M. Thompson, Macedon.

Rock specimens from County Donegal.

From W. A. M'Laughlin, Esq.

Specimens of fossil coral (*Lithostrotian basaltiforme*) from Armagh.

From The late Miss Jane Thompson, Dublin.

Large portrait, in oil, of the late William Thompson, author of the Natural History of Ireland.

From R. Lloyd Patterson, Esq., J.P., F.L.S.

Portrait, in oil, of the late Robert Patterson, F.R.S., author of several Zoological works, and one of the founders of the Society.

From Miss Anna MacAdam,

Portrait, in oil, of Robert MacAdam, former editor of the Ulster Journal of Archæology.

From Edward M'Connell, Esq.

Specimen of syenite from Rostrevor.

From The Corporation of the City of London.

Two medals struck in commemoration of the marriage of the Duke of York, and the visit of the King of Denmark.

From Robert Corry, Esq.

The sepulchral urn dug up at Knock.

From The Misses Crawford, College Green.

A ladies' richly embroidered spencer, made near Carrickfergus in the times of Queen Anne.

From Mrs. Hugh Hyndman.

A box of classic medallions.

ADDITIONS TO THE LIBRARY, 1ST MAY, 1894, TILL 1ST MAY, 1895.

ADELAIDE.—Transactions of the Royal Society of South Australia. Vol. 18, 1893-94. *The Society.*

ALBANY.—The 45th and 46th Annual Reports of the New York State Museum, 1892 and 1893. *The Director.*

AUSTIN, Texas.—The Principles of Elliptic and Hyperbolic Analysis, by Professor A. Macfarlane, LL.D. *The Author.*

BELFAST.—Report and Proceedings of the Belfast Naturalists' Field Club. Ser. 2, vol. 4, part 1. *The Club.*

Catalogue of Early Belfast Printed Books, by John Anderson, J.P., F.G.S. *The Editor.*

BERLIN.—Verhandlungen der Gesellschaft für Erdkunde zu Berlin. Vol. 21, nos. 4-9, 1894; and vol. 22, nos. 1—3, 1895. *The Society.*

BOSTON.—Proceedings of the Boston Society of Natural History. Vol. 26, parts 2 and 3, 1894. Memoirs, vol. 3, no. 14, 1894; and Occasional Papers, no. 4, also Geology of the Boston Basin, vol. 1, part 2; and maps. *The Society.*

BRESLAU.—Zeitschrift für Entomologie herausgegeben vom Verein für Schlessiche Insektenkunde zu Breslau. New series, part 19, 1894. *The Society.*

BRIGHTON.—Report and Abstracts of the Brighton and Sussex Natural History and Philosophical Society, 1894. *The Society.*

BRUSSELS.—Bulletin de la Société Royale Botanique de Belgique. Vols. 30—32, 1891-94. *The Society.*

Annales de la Société Entomologique de Belgique. Vols. 27 and 28, 1893-94. *The Society.*

CALCUTTA.—Records of the Geological Survey of India. Vol. 27, parts 1—4, 1894; and vol. 28, part 1, 1895; also Geology of India, Stratigraphical and Structural (Oldham), 1893. *The Director of the Survey.*

CAMBRIDGE.—Proceedings of the Cambridge Philosophical Society. Vol. 8, part 4, 1895. *The Society.*

CAMBRIDGE, U.S.A.—Bulletin of the Museum of Comparative Zoology. Vol. 25, nos. 7—11, 1894; and Annual Report of the Curator, 1894. *Alex. Agassiz, Curator.*

CARDIFF.—Report and Transactions of Cardiff Naturalists' Society. Vol. 26, part 1, 1894. *The Society.*

CASSEL.—Bericht (39) des Vereins für Naturkunde zu Kassel, 1894. *The Society.*

CORDOVA.—Boletin de la Academia Nacional de Ciencias in Cordoba. Vol. 12, part 1. *The Academy.*

CHRISTIANIA.—Forhandlinger i Videnskabs Selskabet i Christiania. Nos. 1—21, 1893, and Oversigt, 1893. *The Royal University of Christiania.*

DANTZIC.—Schriften der Naturforschenden Gesellschaft in Danzig. Vol. 8, parts 3 and 4, 1894. *The Society.*

DUBLIN.—Scientific Transactions of the Royal Dublin Society. Ser. 2, vol. 4, part 14, 1892; and vol. 5, parts 1—4, 1893

Proceedings, vol. 7, part 5, 1892; and vol. 8, parts 1 and 2, 1893. *The Society.*

EDINBURGH.—Transactions and Proceedings of the Botanical Society of Edinburgh. Vol. 20, part 1, 1894. *The Society.*

Proceedings of the Royal Physical Society. Vol. 12, parts 1 and 2, 1893-94. *The Society.*

EMDEN.—Jahresbericht (78) der Naturforschenden Gesellschaft in Emden, 1892-93. *The Society.*

GENOA.—Giornale della Società di Letture e Conversazioni Scientifiche di Genova. Anno 17, January and March, 1895. *The Society.*

GLASGOW.—Proceedings of the Philosophical Society of Glasgow. Vol. 25, 1894. *The Society.*

HALIFAX, N.S.—Proceedings and Transactions of the Nova Scotian Institute of Science. Ser. 2, vol. 1, part 3, 1893. *The Institute.*

HALLE.—Leopoldina, Amtliches Organ der Kaiserlichen Leopoldino-Carolinischen Deutschen Akademie der Naturforscher. Vol. 29, 1893. *The Academy.*

HAMBURG.—Abhandlungen aus dem Gebiete der Naturwissenschaftlichen Verein in Hambourg. Vol. 13, 1895. Verhandlungen.

IGLO, Austria-Hungary.—Jahrbuch des Ungarischen Karpathen Vereines. *The Society.*

Kharkow.—Travaux de la Section Medicale de la Société des Sciences Experimentales. Vol. for 1893. Also Section des Physico Chimiques, part 1, 1894. *The Society.*

LAUSANNE.—Bulletin de la Société Vaudoise des Sciences Naturelles. Ser 3, vol. 30, nos. 114 and 115, 1894. *The Society.*

LONDON.—Reports of the British Association. Volume for 1893; and volume for 1894.

The Association.

Quarterly Journal of the Geological Society. Vol. 50, parts 198—200; and vol. 51, part 201, 1895; also, List of Fellows for 1894. *The Society.*

Journal of the Royal Microscopical Society. Nos. 100—103, 1894; and nos. 104 and 105, 1895.

The Society.

Transactions of the Zoological Society. Vol. 13, part 9, 1894. Proceedings, parts 2 and 3, 1894.

MADRAS.—Bulletins 1—3 of the Madras Government Museum, 1894-95; and Administration Report for the year, 1893-94.

MANCHESTER.—Journal of the Manchester Geographical Society. vol. 9, nos. 7—12, 1893; and vol. 10, nos. 1—3, 1894. *The Society.*

Transactions of the Manchester Geological Society, Vol. 22, parts 16, 18, 19, 20, 21, 1894; and vol. 23, parts 1—4, 1894-5. *The Society.*

MEXICO.—Anuario del Observatorio Astronomico Nacional de Tacubaya. Ano 15, 1894, and Boletin, vol. 1, nos. 17—20, 1894-95. *The Director.*

MILWAUKEE.—Eleventh and Twelfth Annual Reports of Milwaukee Public Museum, 1893-94.

The Trustees.

MINNEAPOLIS.—Bulletin 9, part 3, of the Geological and Natural History Survey of Minnesota, 1894.

First Report of the State Zoologist, with Notes on the Birds of Minnesota, 1892, from H. F. Nachtrieb, State Zoologist.

MOSCOW.—Bulletin de la Société Impériale des Naturalistes de Moscou. Nos. 1—4, 1894; and no. 4, 1895.

The Society.

NANTES.—Bulletin de la Société des Sciences Naturelles de L'ouest de la France, vol. 4, parts 1—3, 1894.
The Society.

NEW YORK.—Annals of the New York Academy of Sciences. Vol. 7, nos. 6—12, and vol. 8, no 4, 1894.
The Academy.

Bulletin of the American Geographical Society. Vol. 25, no. 4, part 2, 1893; and vol. 26, nos. 1—4, 1894. *The Society.*

ODESSA.—Memoirs of the Society of Naturalists of New Russia Vol. 18, part 2, 1894. *The Society.*

OPORTO.—Annals de Sciencias Naturaes. Vol. 1, 1894; and vol. 2, nos. 1 and 2, 1895.
The Director of the Biological Laboratory.

PADUA.—Bulletino della Società Veneto-Trentina di Scienze Naturali in Padova. Vol. 5, no. 4, 1894; and Atti, ser. 2, vol. 2, fasc. 1. 1895. *The Society.*

PHILADELPHIA.—Proceedings of the Academy of Natural Sciences of Philadelphia. Vol. 23, nos. 144 and 145, 1894; and vol. 31, no. 142, 1893.
The Academy.

Proceedings of the American Philosophical Society. Vol. 31, no. 142, 1893; and vol. 33, nos. 144 and 145, 1894. *The Society.*

PISA.—Atti della Società Toscana di Scienze Naturali, Processa Verbali. Vol. 9, 4 parts, March till November, 1894. *The Society.*

RIO DE JANEIRO.—Archivos do Museu Nacional. Vol. 8, 1892.
The Director.

ROME.—Atti della Reale Accademia dei Lincei. Vol. 3, 1st semestre, fasc. 8—12, 1894; 2nd semestre, fasc. 1—12, 1894; vol. 4, 1st semestre, fasc. 1, 2, 3, 5, 6, 7; 2nd semestre, fasc. 4, 1895; also Rendiconto dell 'Aduanza Solenne dell 3 June, 1894. *The Academy.*

Bollettino della Società Romana per gli Studi Zoologici. Vol. 3, nos. 2—6, 1894 ; and nos. 1 and 2, 1895. *The Society.*

STAVANGER.—Stavanger Museums Aarsberetning for 1893. *The Trustees.*

STIRLING.—Transactions of the Stirling Natural History and Archæological Society for 1893-94. *The Society.*

STOCKHOLM.—Handlingar of the Royal Swedish Academy. Vol. 25, parts 1 and 2, 1892 ; Bihang, parts 1—4, 1893 ; Ofversigt, vol. 50, 1893 ; and Lefnadsteckningar, vol. 3, part 2, 1894 ; also Carl Von Linne's Brefvexling, 1885. *The Academy.*

TOKIO.—Mittheilungen der Deutschen Gesellschaft für Natur- und Volkerunde Ostasiens. Vol. 6, 2 parts, 1894. *The Society.*

TORONTO.—Transactions of the Canadian Institute. Vol. 4, part 1, no. 7, 1894 ; and Report of the Minister of Education, 1894. *The Institute.*

UPSALA.—Bulletin of the Geological Institution of Upsala. Vol. 1, no. 1, 1892, and no. 2, 1893. *The Institution.*

VENICE.—La Notarisia Commentario Ficologico. Vol. 9, parts 4 and 5, 1894. *The Editor.*

VICENZA.—Laghi Alpini Valtellinesi, by Professor Paulo Pero, 1894. *The Author.*

VIENNA.—Verhandlungen der Kaiserlich-Koniglichen Geologischen Reichsanstalt. Nos. 1—3, and nos. 5—18, 1894. *The Society.*

Verhandlungen der Kaiserlich-Koniglichen Zoologisch-Botanischen Gesellschaft. Vol. 44, parts 1—4, 1894 ; and vol. 45, parts 1—3, 1895. *The Society.*

WASHINGTON.—Annual Reports of the American Historical Association for the years 1892 and 1893.
The Association.

Tenth Annual Report of the Bureau of Ethnology, issued for year 1888-89, 1893; also Bibliography of the Wakashan Languages, the Pamunkey Indians, and the Maya Year, 1894.
The Bureau of Ethnology.

Annual Report of the United States Geological Survey. Vol. 12, parts 1 and 2, 1890-91; vol. 13, parts 1 and 2, 1891-92. Bulletins, nos. 97—117, 1893-94. Monographs, vol. 19, 1892, and vols. 21 and 22, 1893. Mineral Resources, vols. for 1892 and 1893. *The Director.*

Proceedings of the United States National Museum. Vol. 15, 1892; and vol. 16, 1893; and Bulletins nos. 43—46, 1893. *The Director.*

Smithsonian Report, 1892; and Smithsonian Reports of United States National Museum for 1891 and 1892. Smithsonian Contributions to Knowledge, vol. 27, no. 884, "The Internal Work of the Wind," *The Institution.*

ZURICH.—Vierteljahrschrift der Naturforschenden Gesellschaft in Zurich. 39th year, parts 2—4, 1894; and 40th year, part 1, 1895; also Neujahrsblatt for 1895. *The Society.*

From R. LLOYD PATTERSON, Esq., J.P., F.L.S.—Journal of the Linnean Society—Botany, vol. 26, no. 177, 1894; vol. 30, nos. 208 & 209, 1894; and 210, 1895. Zoology, vol. 24. no. 157, 1894; vol. 25, nos. 158—60, 1894; also Proceedings, May, 1894.

From MISS ANNA MACADAM, Belfast.—A large number of books and manuscripts, being a selection from the library of the late Robert MacAdam, Esq.

BELFAST

NATURAL HISTORY & PHILOSOPHICAL SOCIETY

SESSION 1894-95.

13th November, 1894.

INAUGURAL ADDRESS BY THE PRESIDENT.

ROBERT LLOYD PATTERSON, Esq., J.P., F.L.S.

THE PRESIDENT, who was cordially received, said that, on assuming the presidential chair at that the opening meeting of the seventy-fourth session of their Society he was pleased at being able to congratulate his fellow-members on its continued vitality and activity, notwithstanding its advancing years. His warm thanks were due to the Council for having for the third time, after an interval of thirteen years since his first election as president, again placed him in that position. It was one the honour of which he fully appreciated, and the responsibilities of which he trusted he was sensible of, and the duties of which it should be his earnest endeavour adequately to discharge. Continuing, the President said that, to the thoughtfulness of a lady—a life-long friend and well-wisher of the Society, the late Miss Thompson—they were indebted for the bequest of an admirable portrait of her brother, Mr. William Thompson, one of the most distinguished of their former presidents. A member had presented a very good likeness of another former president, Mr. Robert Patterson, while to a valued and useful member, Mr. Swanston, they were much indebted for the recent gift of a bust of one of the most eminent naturalists the century had produced — Professor Edward Forbes—a man of truly remark-

able powers and brilliant genius. The three had been united in bonds of the closest friendship, cemented by a community of taste and of interest in certain branches of science, the pursuit of which was to Forbes a profession, to Thompson—a man of means and leisure—an occupation ; but to Patterson—a man of business—merely a relaxation. It occurred to him (the President) that the acquisition by the Society almost simultaneously of these mementoes of the three friends might fittingly be made the occasion of a brief review of their lives. He could not recall Mr. Forbes. He knew he had seen him ; but he remembered Mr. Thompson very well indeed. He was the first of the three to be called away. After speaking of the early life of Mr. Thompson, the President pointed out that his first contribution to the proceedings of one of the English learned societies seemed to have been in 1833—a communication on the Arctic Tisu and other rare birds observed in Ireland made to the Zoological Society of London. From that period up to the time of his premature and lamented death he was a frequent and valued contributor to the different English scientific journals. Visits to London, and later the annual meetings of the British Association for the Advancement of Science, brought him into contact with the most eminent men of the day, who were not slow in discovering what a power of observation, research, and description lay in the modest, retiring young Irishman, who soon took his place as their peer simply by the intuitive right of genius among the foremost of them. Without reference to Queen's College, which did not then exist, but to which they since owed much, the Belfast of forty-five or fifty years ago took a higher relative plane as regarded both literature and science than did the much larger and wealthier city of to-day. Besides Mr. Thompson, he remembered Dr. Hincks, Dr. Drummond, Mr. Grattan, Mr. Hyndman, Mr. Richard Davidson, Sir James Emerson Tennant, Rev. John Scott Porter, Mr. James Bryce, Mr. Garrett, Mr. Bottomley, Dr. MacCormac, Mr. Gordon Thompson, Mr. Edward Getty, Dr. Staveley, Mr. James MacAdam, Dr. Andrews, and others only lately removed from

them, not to mention some who happily still remained. The public lives of these became so interwoven with one another and with those of their fellow-workers in the same branches elsewhere that it might be well to mention the names of some of the latter, foremost among whom as friends stood Edward Forbes and Robert Ball, the latter the respected sire of a distinguished son, who lately honoured Belfast with a visit. The names of the others were legion, but amongst these he vividly recalled Captain Graves, R.N.; Professor Balfour, Dr. Lyon Playfair (now Lord Playfair), Professor Jukes, Dr Allman, the Earl of Enniskillen, Dr. Carpenter, Prince Charles Lucien Bonaparte, Sir Roderick Murchison, Professor Owen, and Hugh Miller, not to mention many others equally distinguished, of whom, however, he had no personal recollection. Sir C. Wyville Thomson and others appeared later.

The President then dealt with the late Mr. Thompson's love for art as well as for nature, and said he became president of that Society in 1843, and continued to take a deep interest in its affairs. An important contribution to ornithology was made by Mr. Thompson in 1849 in a work on the natural history of Ireland. It at once took the leading position its exhaustive character and scientific accuracy no less than its literary merit entitled it to, and confirmed its gifted author in the position he had already won as the leading Irish authority on the subject. The President said Mr. Thompson died suddenly when only forty-six years and three months old, and, while he had no recollection of the profound sensation caused in Belfast by his early and sudden demise, he could well imagine it. As a proof of his untiring industry, Mr. Patterson mentioned that the number of Mr. Thompson's published papers, including his "Natural History of Ireland," &c., was seventy-three. As to Robert Patterson, he should for obvious reasons say less. He survived his friend Thompson exactly twenty years. His was an uneventful, busy, happy life, passed in a business to which he had been brought up, which he inherited from his father and left to his eldest son. With him literature and science,

although a passion, were merely a relaxation, not an occupation. His books were written in the leisure of his evenings at home, and published with the hope of enlisting more general interest in the study of natural history. He was one of the earliest, strongest, and most consistent advocates for the adoption of natural history as a regular part of the education of our youth, and he lived to see the realisation of much of his dream. Mr. Patterson was one of the seven founders of the Society in 1821. He passed through almost every minor office in it till 1852, when on Mr. Thompson's death he was elected president, an office which he subsequently filled on more than one occasion. Referring to Professor Forbes, the speaker said he was an original commanding genius, and a most interesting personality. He was born at Douglas, Isle of Man, on the 12th February, 1815, and died at Edinburgh on the 18th November, 1854, aged only thirty-nine years and nine months. During his short life he accomplished an enormous amount of work. Mr. Patterson then gave some very interesting particulars of Forbes's life, taken from his biography. His first visit to Ireland seemed to have been in 1840, and at Belfast, his biography states, he found his old friends and fellow-naturalists, William Thompson and Robert Patterson. In 1844 Forbes received the appointment of palæontologist to the Geological Survey, and he now entered into a position congenial to his tastes, which gave him more leisure than the offices he had previously filled. He married in 1848 a daughter of General Sir C. Ashworth, whom he met when visiting a friend's house. His married life was very happy, but all too short. In 1851 the School of Mines, which might be regarded as an outcome of the Geological Survey, was established, and in it Forbes got the appointment of lecturer on natural history as applied to geology and the arts. The height of Forbes's ambition was reached in 1854, when he was appointed, on the death of his old master, Professor Jameson, to the chair of natural history in the University of Edinburgh. His Edinburgh duties commenced under the most favourable auspices and amid great enthusiasm on the 15th May, and

terminated six months thereafter with his death. Thus early closed the life of Edward Forbes, of whom it was no exaggeration to say that his was a most original, versatile, and brilliant intellect of the highest order. His early death was an irreparable loss to the whole scientific world of the period.

The PRESIDENT of the Belfast Queen's College (Rev. Dr. Hamilton) said that the duty which he had been asked to discharge that night was one that was exceedingly congenial to him. His only regret was that it had not fallen into hands more able to do it justice. Before proceeding to formally move the vote of thanks with which he had been entrusted, he could not deny himself the pleasure of expressing his thanks to the learned President of that Society for the address with which he had just favoured them. He learned that it was not the custom to move formally a vote of thanks for such an address ; but speaking for himself—and he was perfectly sure that he was also speaking for them— he must say that he had seldom listened to a more interesting or complete paper of the kind than that which his friend Mr. Patterson had just read to them. That account of the trinity of worthies whose lives he had brought before them was intensely gratifying. He had only one regret about it, and it was that it did not deal at a greater length with the biography of the second of the two gentlemen to whom he had alluded—viz., Mr. Robert Patterson—but he supposed they all understood the reason why he had passed over that part of the subject so briefly. He hoped, however, that at some other meeting, or in some other way, a fuller account of Mr. Patterson's life might be given, because if there was one to whom that Society and the Museum owed a debt of gratitude it certainly was to the father of the learned President of the Belfast Natural History and Philosophical Society. His duty, however, was to move that the best thanks of that Society be given to the donors of the gifts, a list of which had been read to them by Mr. Young. It was very satisfactory to find that the Museum still maintained its popularity, and that so large a portion of the people of Belfast were so thoughtful as to remember it when they had

objects of interest worthy to find a place on its shelves. He supposed that he might say with truth that the two most notable objects in that collection were the two portraits before them. It seemed to him a peculiarly fitting thing that those two portraits should come to the Society together, and were that night at once placed side by side upon the walls of that room. Both Mr. Thompson and Mr. Patterson were Belfast men bred and born as they said, and they not only lived in Belfast all their lives, but they loved Belfast. Indeed, there was a curious parallelism between their careers throughout. Not only were they both Belfast men, but they both devoted themselves to the study of natural history, both gave themselves to the service of that Society, and both were elevated in their turn to the highest office in the Society, the office of president. When Mr. Thompson died Mr. Patterson became his literary executor, and carried through the Press the fourth volume of his "Natural History of Ireland," prefixing to it a biography of his friend. And now it was a surely interesting thing that when the one had been lying in his grave more than forty years, and the other in his more than twenty, they were still united in death as they had been in life. Their portraits on the one night coming into the possession of the Society would hang together on those walls to tell future generations of the manner of men they both were, and continue to stimulate Belfastmen to the study of that branch of science to which both of them so heartily devoted themselves. Mr. Thompson he never had the pleasure of knowing; Mr. Patterson he could remember well, and if in any place his name ought to be mentioned with honour in Belfast it should be there. It had always struck him as a remarkable thing that that young man of only nineteen years of age should have been one of the founders of that Society. It proved to them how early the love of science had been born within him, and how strongly it grew with his life and strengthened with his strength. As they had heard already, that occurred in the year 1821, and from that time until his death, 1872, everyone knew that that Society and that Museum were dear to him. Many of them had heard, and

some of them would recollect that, in the year 1871 the completion of his fifty years' connection with the Society was commemorated with an address—a copy of which he (Dr. Hamilton) had in his possession—which was presented to Mr. Patterson, he supposed in that room. In that address, which was signed by the principal people of Belfast, was used this remarkable language about him—"There is no living man who has done more for the popularisation of the study of natural history in Ireland, or for the giving to it its legitimate place in the education of the young." That language was perfectly true. From the publication of Mr. Patterson's first work, the letters regarding the insects mentioned in Shakspere, down through their various divisions to his "Zoology for Schools" and zoological diagrams, he had one object before him—to press upon the people the study of natural history and make that study easy. It therefore ought to be a matter of very great gratification to that Society—and not only to that Society but to the whole of Belfast—that there would now be in that Museum a portrait of Mr. Patterson to preserve his features and memory for generations yet to come. But there was one more extremely pleasant feature in the proceedings of that evening. Unfortunately, as they all knew, eminent men had not always sons who were like minded. There had been exceptions to that rule, but unfortunately they were not numerous. No one, however, could have listened to the paper read there that night without recognising very clearly the fact that in this case Mr. Robert Patterson, senior, had a son who was worthy of his sire. It was extremely pleasant to find that it was so, and to know that the name was still honoured in the present generation—honoured indeed in more than the present generation, for in the third and he believed in the fourth generations the talent was still descending. Many of them no doubt had enjoyed as he (the speaker) had done the pleasant companionship of his "Birds, Fishes, and Cetacea of Belfast Lough." It had been to him a most useful and charming companion in many a seaside ramble.

Mr. Robert Young, J.P., seconded the motion. He could

not help referring to the fact that he had had the great honour and privilege of knowing both Mr. William Thompson and the President's worthy father. The first time that he really came into contact with Mr. Thompson was at the British Association in 1852. Having made a graceful allusion to the late Mr. Robert Patterson, Mr. Young said that he was sure they had all very much enjoyed the President's address.

The PRESIDENT, in putting the motion, expressed his deep obligations to Dr. Hamilton and Mr. Young for the very kind way in which they had spoken about his father, and the far too flattering way in which they had referred to himself.

The motion was passed by acclamation, and the meeting then concluded.

November 27th, 1894.

Robert Lloyd Patterson, Esq., J.P., F.L.S., President, in the Chair.

Rev. W. S. Green, M.A , F.R.G.S., H.M. Inspector of Fisheries, gave a Lecture on

"SEA FISH AND FISHING OFF THE WEST OF IRELAND."

The President expressed the pleasure it afforded him to preside at a meeting at which their good friend Mr. Green, who had travelled from Dublin to meet them, would lecture. Mr. Green had appeared before Belfast audiences on more occasions than one, and he needed no introduction from him.

Mr. Green then proceeded with his lecture, which he prefaced by throwing on the screen a map of the British Isles, showing the depths of the sea from near the coast down to the profound abysses of the Atlantic. Fishing grounds were only found at moderate depth, these extending to a distance of from ten to twenty miles off the West of Ireland; but in the North Sea immense fishing areas existed, each having a depth of about fifty fathoms; indeed, these were amongst the finest fishing grounds in the world. While Mr. Balfour was Chief Secretary for Ireland he made an effort with the Royal Dublin Society to start an expedition with the view of developing the Irish fisheries. They had worked for two years from the south of Cork to the north of Donegal and had done some good work. He then proceeded to describe the fishing boats used on the west coast, mentioning that the efforts made in 1847, the year

of the famine, by the British Fisheries Society, which was then started, but which had long since ceased to exist, had borne good fruit. Great improvements had been effected in the boats, and those used on the Donegal coast and other places were made after a model which originally came from Norway. They were weatherly and suitable for certain places, for of course the boat must be such as would suit the peculiarities of different places. The splendid qualities of the fishing canoe used on the west coast were then descanted upon, and by their means, Mr. Green pointed out, a lucrative trade was carried on. As many as ninety French boats and two hundred Manx boats came over to Irish waters every year for mackerel fishing. In addition to spring mackerel fishing there was an autumn mackerel fishing carried on by the natives, and the extent of it could be estimated from the fact that last year as much as £50,000 worth of mackerel had been sent to America, and that exportation had been going on for the past seven years. At several places stations had been established for the curing of fish, these numbering eighteen, and they had been successful on the west coast of Kerry. It had also been tried at Killybegs, and was only on its trial at Mayo, and probably next year something further would be done in this important matter. In this connection Mr. Green mentioned that Mr. Musgrave had greatly facilitated them at Donegal. The next branch of the subject, which was of a highly interesting character, dealt with the development of several species of fish. The eggs, he pointed out, floated in the sea near the surface, the swing of the sea being sufficient to keep them from coming to the surface, where they would be made the prey of various kinds of little enemies. There was an exception to this in the case of the herring, which laid its eggs in the bottom. There were several photos, taken by Mr. Green himself, of a number of the native fishermen of the Arran Islands engaged in working at their perilous calling, and some of the objects of great antiquarian interest which these islands contain were briefly described.

Mr. W. Nicholl acted as lanternist with his usual ability.

The PRESIDENT then called upon

Mr. SEATON F. MILLIGAN, who said he had an announcement to make which he was sure would be received with much interest by all present. They proposed at the end of June next, or the beginning of July, to charter a cross-Channel steamer which would start from Belfast and proceed to Rathlin and on to those islands in Galway of which Mr. Green had been speaking, and which possessed some most interesting antiquities, which all who availed themselves of the excursion would have an opportunity of examining.

This announcement was received with applause.

Professor FITZGERALD then proposed a hearty vote of thanks to Mr. Green for his interesting lecture. The subject of Irish fisheries was one that many people there knew little about, except in a general way, and it was an industry that had not been worked up as effectively as it might have been. The Government were fortunate in securing Mr. Green's services as a fishery inspector, and the work which he had done on behalf of the fishing industry in Ireland was of an extremely valuable character, and would have very valuable results.

Mr. JOHN BROWN, in cordially seconding the vote, wished to know Mr. Green's opinion on the question of trawling. He should imagine that trawling could not do the eggs much harm in deep water, and that it was really in shallow water that any injury could be done by trawlers.

The motion was passed by acclamation.

The PRESIDENT conveyed the vote in appropriate terms, and said in reference to the question of trawling he shared Mr. Brown's opinion on the subject.

Mr. GREEN, in acknowledgment, thanked the audience for their patient hearing and kind vote of thanks, and said he had some difficulty in answering directly the question put by Mr. Brown, because sometimes it was his business to sit on cases which involved the question of trawling. There was no doubt shallow waters were the nurseries for the young fish, and he hoped Mr. Brown would be satisfied with that answer.

4th December, 1894.

Mr. J. Brown read a Paper on

ELECTROLYTIC CRYSTALLIZATION OF METALS.

The metals are electrolytically deposited from aqueous solutions of their compounds, contained in little cells* provided with platinum wires for connexion to the battery. The cells are of a form suitable for the lantern microscope by which images of the crystals in the act of formation are projected on the screen. The electrolytic crystallization of metals has been studied by Dr. Gladstone and others, but I am not aware that the actual growing of the crystals has ever before been exhibited to an audience. The effect on the screen is very striking and in some cases the forms observed are very curious and beautiful.

The solutions to be operated upon contain stannous chloride, lead acetate, silver nitrate, cupric chloride and cadmium chloride; the last mentioned repeated with litmus coloration to show the evolution of chlorine as hydrochloric acid at the positive pole. The effect of this evolution of chlorine or other anion is also seen when, after the formation of a deposit of metallic crystals on one pole, the current is reversed and the chlorine attacks the metal previously deposited and dissolves it off in combining with it to re-form the chloride.

The accompanying figures from photo-micrographs illustrate two of the forms observed. In both cases *N* denotes the position of the negative pole from which the crystals grow. The crystal of tin, fig 1, forms very rapidly in a concentrated solution of the chloride under the influence of a battery of about three volts electromotive force. The rapid shooting out across the screen of the image of such a crystal or congeries of crystals is very

* I am indebted to the kindness of Mr. W. S. M'Kee for the construction of a number of these cells.

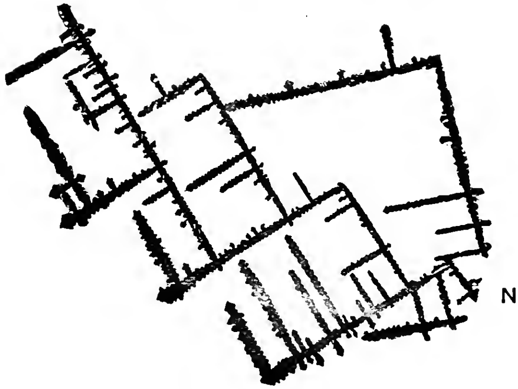


FIG 1.

striking, especially when we consider the wonderful amount of accurately directed molecular activity thus suddenly called into play by the current.

FIG 2.

Fig. 2 represents the form assumed by lead deposited from its acetate by an electromotive force of about seven volts. It forms more slowly than tin. Cadmium and silver crystallize also in

arborescent forms characteristic of these metals; copper in a more compact form.

In the experiment with cupric chloride, the bright green colour of the saturated solution helps to make apparent the phenomenon known as migration of the ions. The dilution of the solution near the cathode, due to their unequal speed of migration, causes striæ of more dilute, and therefore lighter coloured solution to ascend from this neighbourhood.

I referred above to the observed fact that while the metal is deposited at the negative pole, the chlorine or other anion of the compound is evolved at the positive pole. The question arises as to how the compound is split up so as to evolve its parts at these two distant points without either of those parts appearing in the interval between the poles. This question has been asked ever since Nicholson and Carlisle in the first year of this century discovered the decomposition of chemical compounds by the current. It has not yet received an entirely satisfactory answer.

One of the earliest explanations assumed that each metal atom had a little positive electric charge on itself, and was therefore attracted like a pith ball to the negatively charged pole, and conversely each chlorine atom had a little negative charge causing it to be attracted to the positive pole. This hypothesis seems to me to amount simply to an admission that we know little or nothing about electricity or atoms. To take an analogy, we know that an atom of tin in combining undirectedly with two atoms of chlorine evolves a definite amount of heat, but we do not, therefore, assume that this heat was previously charged on those atoms; yet when the combination takes place in a directed way so that electricity is thereby evolved in place of heat, such electricity is, with no more apparent reason, said to have been previously charged on the atoms.

Coupled with the supposition that the atoms were charged in opposite ways, it was necessary to introduce some theory that would allow them to be freely attracted to the opposite poles. It was, therefore, assumed that a compound such as tin chloride was separated into independent tin atoms and chlorine atoms by

the mere act of solution. When we consider that the atoms of tin and chlorine appear to have a considerable mutual attraction this seems absurd, and if we take another metal with even a greater affinity for chlorine the absurdity is still more evident. One ounce of the metal aluminium, in combining with the equivalent quantity of chlorine, evolves energy sufficient to shoot a ton weight over 300 feet high in the air, that is, if all the energy could be applied to shooting tons into the air.

Are we to suppose, that when we dissolve the resulting aluminium chloride in water, the whole 300 foot-tons are temporarily annihilated and the atoms separate again to suit the impatient exigencies of modern electrolytic assumptions; or are we as an alternative to assume that, though the joining together of the atoms evolves this amount of energy, their separation may be effected without its absorption? Both hypotheses seem to me most doubtful.

Nevertheless this theory has in recent times been revised by some of the German physicists under the name of the dissociation theory. It has also been called the Williamson-Clausius hypothesis because it was stated to have been supported by these authors. In a paper published in the *Philosophical Magazine* three years ago, I showed that it was not supported by Williamson, so that this name does not apply. I have suggested another however, the neatness, comprehensiveness, and appropriateness of which, considering the German origin of the theory, will I doubt not be recognised. It is

Freidochgebundendurchcontactelectrisirtetheilmoleculishebeweglichkeit.

The theory would appear to be quite as long-winded, intricate and impossible as the name. We shall, therefore, dismiss it and turn to a much simpler hypothesis which is based on the electrolytic theory of Grotthus and is the modification of this accepted by Faraday. With that modesty which characterised the unassuming greatness of his mind he refused to follow a hypothesis, so unwarranted as that involving electrified atoms, and gently putting it aside proceeded to free himself and his writings from all danger of connexion with it by coining new electrolytic nomenclature. I regret to add that many of Faraday's

terms have been corrupted and tacked on to the very hypothesis, they were coined to avoid.

In Vol. I of his *Experimental Researches*, p. 148, § 518, he says—" Passing to the consideration of electrochemical decomposition, it appears to me that the effect is produced by an internal corpuscular action, exerted according to the direction of the electric current, and that it is due to a force either *superadded to* or *giving direction to the ordinary chemical affinity* of the bodies present. The body under decomposition may be considered as a mass of acting particles, all those which are included in the course of the electric current contributing to the final effect ; and it is because the ordinary chemical affinity is relieved, weakened, or partly neutralized by the influence of the electric current in one direction parallel to the course of the latter, and strengthened or added to in the opposite direction, that the combining particles have a tendency to pass in opposite courses." He then goes on to explain by means of a diagram, the interaction of the particles on the decomposing liquid.

With a degree less of that dignified modesty of reserve in presence of the unknown which characterized the great philosopher, I have somewhat elaborated this diagram in order to produce a mechanical lantern slide which might give a possible elucidation of the question as to how the particles of the anion cross to the anode, while those of the cation cross to the cathode without in either case appearing in the free state in the interval. The working of the slide may be illustrated by the following scheme, where in line (1) a^1, a^2, a^3, etc., represent particles of an anion, such as chlorine in combination with b^1, b^2, b^3, etc., particles of the cation such as tin. The effect of the current may now be supposed to loosen the attraction between a^1 and b^1, while it increases that between b^1 and a^2, causing an interchange of partners here, and also all along the line, resulting in the arrangement shown in line (2).

(1)		a^1b^1,		a^2b^2,	a^3b^3,	a^4b^4,	a^5b^5		
(2)	P	a^1,	b^1a^2,	b^2a^3,	b^3a^4,	b^4a^5,	b^5		N
(3)		a^1,	a^2b^1,	a^3b^2,	a^4b^3,	a^5b^4,	b^5		
(4)		a^1,	a^2,	b^1a^3,	b^2a^4,	b^3a^5,	b^4,	b^5	

In line (2), we have now, however, the *a* particles turned towards the negative pole *N*, and the *b* particles towards the positive. We therefore assume that the molecules rotate on their axes and form up as in (3), ready for a second electrolytic effect represented in (4), where we see that two particles, a^1, a^2, of the anion have now been set free at the positive pole, and two particles, b^4, b^5, of the cation at the negative pole, leaving the remainder of the substance in the same compound form as at first. A continued repetition of these processes may be supposed to constitute electrolysis of a simple binary compound in the liquid state. In the case of solutions where there are present two compounds (the solvent and the substance dissolved in it, only one of which may be undergoing electrolysis), the action is evidently more complex. Still a similar process seems possible. It must not of course be understood that the above is put forward as anything more than a working hypothesis. There is no *experimentum crucis* to prove it, but it appears to me to avoid some of the difficulties inseparable from the dissociation theory to which I have referred.

Mr. WORKMAN—There was one point which struck me if I followed Mr. Brown correctly. The atoms of tin were free atoms, as far as the explanation went, and the red dots shown on the screen represented free atoms. Were the other atoms also free? The experiment was exceedingly beautiful, and well worthy the lecturer.

Mr. BROWN—I do not quite understand Mr. Workman's difficulty. In the beginning, when the substances are all combined, there are according to the view I adopt no free atoms. What I meant by a "free atom" was an atom wandering about by itself as required by the dissociation theory. In reply to the question asked as to what cells I have used for my experiments, I may say that I am using five dry cells. I do not use all the cells for every experiment; for instance, that with tin chloride only required three. I have an arrangement for putting in circuit any number of cells I require.

A Second Paper was read by

A. S Cleaver, Esq., B.A., Entitled :—

ACROSS THE NORTH ISLAND OF NEW ZEALAND THROUGH THE HOT LAKE DISTRICT.

The Hot Lake District of New Zealand lies in the province of Auckland about one hundred and fifty miles south-east of the city of that name, and about forty-five from the port of Tauranga ; the thermal region proper includes Lakes Rotorua, Rotoiti, Rotoehu, Rotoma, Tarawera and numerous other "rotos" of smaller extent. A large tract of pumice country separates this from the Taupo district which is also volcanic and another centre of thermal activity. The line of volcanic action may be said to run almost the whole length of the North Island from the north-west to the south-east corner, roughly speaking, but at present I will speak more particularly of that part which is called "*The* Hot Lake district of New Zealand."

Leaving Auckland by train, the country we passed through did not present any features worthy of special notice, except perhaps the land had a more English look than any we had hitherto seen in the colonies, and contrasted strongly with the monotonous appearance of the Australian landscape with its forests of gum trees and large fenced paddocks covered with stumps of dead trees and fallen timber. Hedgerows and furze bushes were here common, green fields and rich corn lands lay stretched out under an azure sky, the stillness of the scene was broken every now and then by the soft notes of the lark, and but for the absence of the village scenes with the weather-beaten church and graveyard, or the white cottages of the labourers, you could easily have fancied yourself going through the Midlands of England or our own County Downon a summer's day. The railway then passed through varied scenery along the valley of

the famous Waikato river, which, once the scene of fierce fighting and campaigning, is now a prosperous agricultural district, and to use the words of another writer "cattle may be seen browsing on the land where once stood the Maori Pah and British redoubt, and Maori faces may be seen grinning a smile of cheerful recognition where they once gloated over the slain."

On the second day the *Lake of Rotorua* comes into view, and as we approached nearer and saw its outline and the distant township enveloped in clouds of steam, felt that we were at length in sight of the Wonderland of the World. At first the view of Ohinemutu, which is the native name of the township, is not impressive. Lying low near the edge of the lake on a sort of peninsula, there are no special features in its situation or surroundings to attract the eye. The lake is large and generally uninteresting, from its sides rise barren low-lying hills and the township presents a picture of the ordinary colonial township, consisting of a small cluster of low wooden houses. Nearing the lake, the first impression is of an odour which cannot be called balmy, and as we approach, it grows in intensity till the whole atmosphere seems charged with the fumes of Hydrogen Sulphide. Arriving at the Lake House Hotel, we were greeted by a curious crowd composed of Europeans, Half-castes and Maori men, women, and children to whom the arrival of the mail coach is a matter of great interest. They seemed to mix and mingle and display a genuine good feeling one to another. Their past feuds quite forgotten, they are now brethren and citizens under our own beloved Queen.

The name of Rotorua being now so well known in connection with those strange natural phenomena *the hot lakes*, and so much having been written thereon, it would be useless for me to describe in detail the wonders of the place ; but for those who have not seen for themselves or may not have read much thereon I will endeavour to sketch as briefly as possible its principal and most interesting features.

All around the shores on the land lying between the township and the lake, and beyond the township, may be seen dense

clouds of steam rising up from the earth, and on closer examination it is not difficult to find the hot springs and pools whose presence the steam betokens. These vary in size and shape from tiny steam jets playfully issuing from the sand on the shore, or from between the stones further up on the beach, to large bubbling cauldrons containing liquids in a high state of thermal activity. Here, we notice among the Ti-tree scrub stones covered with a yellowish deposit which proves to be sulphur. There, a steam cloud rises from a group of boiling springs or superheated mud holes, or perhaps we notice a basin full of the overflow water from the springs which are used by the Maori for bathing purposes. All around are evidences of the presence of a warm region at no great distance from the surface, and one cannot help treading among the scrub with a feeling of insecurity, not knowing what a false step might lead to. That there have been accidents of this sort, the neatly railed little tombstone on the promontory clearly points out. It states "that Martha Hinemoa Wilson was accidentally scalded to death in such and such a year," and indeed to a visitor such a circumstance seems to be easily within the bounds of possibility.

Some of the hot springs serve as pools for washing purposes, others are used as boilers for the village, and are of various capacities, from vast cauldrons capable of boiling a bullock to tiny pools just large enough to cook an egg. The steam issuing from the numerous fissures is utilized by the Maoris for domestic purposes, being adapted in the following manner:—Over one of these steam jets a square hole is made in the ground, just large enough to allow a wooden box with holes bored through the bottom to be set in, and by placing a board or some sacking over the top an excellent steam oven is made, which has the advantage of not requiring any attention, and from a domestic point of view is said to be equal if not superior to the artificial ones. Slabs of stone or boards are sometimes placed over warm spots on the ground where the more lazy of the natives recline and smoke, rolled in their blankets snug-warm.

Among the novelties of the scene which do not fail to attract the visitor are the *Maoris*, whose habits and customs, especially among the older ones, are very little changed with the British occupation, and no place affords such splendid opportunities of studying them as Rotorua. The native quarter of the township is separate from the European, the natives evidently preferring to live in their own simple way, rather than that of their adopted countrymen.

Their houses, or *whares* as they are called, are small huts, with sloping roofs covered with grasses, and projecting slightly in front forming a kind of verandah. They contain usually but one room, where the whole family sleep on mats of flax or blankets, and on the outside are surrounded by a rude fence, enclosing a small piece of ground, in which is grown such vegetables as sweet potatoes and pumkins so much prized by them.

Some of the *whares* of the more well-to-do are artistically carved, and above the door of almost all may be seen the grotesque little wooden figures, with distorted faces, shell eyes, projecting tongues and crossed hands, the presiding deity—the *lares* of the family.

Among the *whares* there is one building which stands out above the rest being larger and more extensively carved, having a flagpole surmounted by carved head; this is the *Atama* or meeting house. Here they meet at regular intervals to hold council or deliberate on their own affairs, and is often the scene of a stormy debate when their tolls or lands are threatened.

The women although inferior to the men in looks are almost their equal in strength, being good workers and expert riders. They never look so happy as when strolling about the village with a baby or two strapped on their backs and a short black pipe in their mouths. Although formerly cannibal, and as shown in the native wars, bold and daring in fight, the Maoris have become tractable and harmless living on the best of terms with the *Pakeha* or white man. Indeed as you inquire more closely into their condition, and hear from themselves how

their lands have been taken from them, how the native birds and animals have been driven out by the imported ones, and how their own numbers are fast decreasing before the train of European civilization, you can at once detect a tone of despair, of sorrow for their dying race. Nevertheless the Maoris know well that their condition and status is better now than ever it has been in the past. They have four representatives in the New Zealand Parliament to whom their interest are entrusted, and if a Maori man chooses to engage in either mental or physical work of any kind, there is nothing to prevent him acquiring land, working a business or entering a profession and raising himself to a level of equality with his fellow citizen. The opportunity is always there, but alas the Maori chooses rather to pass his life in ease, enjoying all the good things of this world, and as long as he has the wherewithal to purchase gin and tobacco his highest hope is realized, his greatest ambition gratified.

Let us now turn from that which satisfies our idle curiosity to something which is of the greatest importance to the New Zealander and the world at large. I refer now to the baths whose curative properties are so well-known.

From the very earliest times since the land was settled by the present native population the Hot Springs were known by the Maoris to possess healing properties. Such was the nature of the different springs, varying from the strongest solutions capable of nearly dissolving iron to the mildest mineral water; that the ancients living in the Hot Lake district had a bath for almost every ill their bodies were liable to. The government of New Zealand being at once alive to this fact, and knowing the value of a thermal district, purchased most of the land round Rotorua, and have now erected a splendid Sanatorium with spacious grounds for the use of invalids.

This Sanatorium and grounds form quite a feature in the otherwise barren neighbourhood. The large wooden building contrasting strongly with the small houses in the township and natives *whares*; the grounds are beautifully laid out and planted

with numerous eucalyptus trees whose fragrance is refreshing amidst the ever present Hot Spring. Here may be seen, I think I am right in saying the only artificial geysers in the world. They are situate inside the grounds, built round with a low wall forming a sort of fountain basin, from the floor of which large pipes project, and by an ingenious method of controlling the supply of cold water (made by the engineer of the district) they are able to make the geysers play at will, and being directed up a uniform pipe, the water is thrown up in a regular column in appearance like a large fountain emitting boiling water. In another part of the grounds there is a hot pool of unknown depth, whose water is of the most transparent blue, called the "Blue pool." Looking down into it from the side, it appears like a large basin in the rock with a hole in the bottom, and as the water is just below boiling point there is no ebullition, the surface is perfectly smooth, and little or no steam rises off it. A story is told of a man with a dog visiting the pool on a very hot day. The poor animal thinking to refresh himself, at the sight of the clear blue water, plunged boldly in and perished immediately in the subtle liquid. The water is strongly impregnated with Sulphur compounds, easily detected by placing in it some article of silver such as a chain or match-box, which is at once turned black. Unfortunately, it is not always necessary to wilfully immerse your silver jewelry to find this out, a short stay in the district will do just as much towards acquainting you with the nature of Silver Sulphide.

In appearance the water of the bath is quite milky, and the temperature about 99·7. A morning scene with men of all nationalities seriously engaged in the attempt to get rid of their bodily ailments, crowded together in the bath is a sight not easily forgotten. In the same pavilion there was also two other baths, The Madame Rachel and Blue baths, which are supplied by springs of an exactly opposite character. The water is alkaline silicious, the commonest form found in the district being used for both drinking and bathing purposes. The water is beautifully soft to the touch, and as a bath for pleasure

or luxury it would be difficult to find its equal anywhere. The peculiar softness of the water makes a gloss on the skin while bathing, and from this fact it is often called the oil bath. Froude says, he who bathes in the Rachel bath is beautiful for ever. Besides these, there are numerous other baths of muddy Sulphur water in and about the Sanatorium grounds, and all the Hotels in the township have private natural hot water baths of their own, which can be used by visitors.

Baths abound everywhere, from the small open air basin used by the Maoris, to the more comfortably enclosed ones of the Sanatorium ; and although I cannot testify as a patient to their restorative or curative properties, yet I can say, that after a long days riding, driving, or sight-seeing, I know from personal experience of nothing so invigorating or soothing as a natural Hot Water bath at Rotorua. While from the medical standpoint, the fact that the baths are patronised and visited by people of every nationality in search of health, and hundreds of cures can be vouched for by the Sanatorium doctors go far to show the value of the balneatory treatment.

Mr. SHILLINGTON—I think this Society is to be congratulated on listening to such members and friends as are not only able but willing to contribute such papers as we have heard this evening. I wish the rules of our Society allowed me to say a word or two with regard to Mr. Brown's paper ; but if we can, in passing a vote of thanks to Mr. Cleaver, allow some of our overflowings to reach Mr. Brown, we shall attain our object. An interesting thing found in connection with travel is the ability to get hold of what we see and be able to reproduce it, and I think our young townsman has completely acquired this faculty. We remember with great regret the destruction of the pink and white terraces referred to, in which catastrophe young Mr. Bainbridge, of Newcastle-on-Tyne, lost his life in such a heroic way in trying to save others. I have pleasure in moving the best thanks of this Society to Mr. Cleaver for his valuable paper.

Professor REDFERN—In coming here to-night to listen to

these two papers, I knew very well what we should get from our friend Mr. Brown. I was not quite sure in the other case but I was very deeply interested, for I had previously heard a great deal from a friend who lived in that district, something of the character of these terraces, and of their sad destruction in 1886, but I had not heard what I have this evening, any such account of the way of getting to these places and the difficulties in the transit. There is not a district in the world which I have longed so much to see, and I don't think anything could have been more interesting than the details brought before us. To call them novel would be speaking of them in a most contemptuous way. I second very cordially indeed the vote of thanks to our young friend.

The President—I esteem it a privilege to be in the chair and in that capacity to welcome Mr. Cleaver. After what has fallen from others I cannot help saying that I have one fault to find with his paper, that it was too short. I think the vote passed by this meeting is greatly enhanced by the fact that it has been seconded ably and eloquently by a gentleman of the eminence of Dr. Redfern, a gentleman whom to know is to appreciate, and whom to appreciate is to love and admire.

Mr. Cleaver—I am exceedingly pleased at the very courteous way in which you have received my humble effort to give you an incomplete outline of my travels in New Zealand. I feel deeply indebted for the kind and flattering manner in which Mr. Shillington and Professor Redfern have spoken of my paper. I am only sorry that time would not allow me to go into the subject in greater detail. It is one which cannot be passed over quickly ; it must be studied carefully and closely, the country is so full of interest in every respect.

Mr. Young—I have great pleasure in moving that the very best thanks of this Society be given to the American Government for their contribution of valuable books ; to the Botanical Institution, of Edinburgh, for the record of their proceedings of 1893 ; and also to the Smithsonian Institute and the Nova Scotia Institute of Science.

Mr. Wright seconded the vote of thanks.

Mr. Gray—I think we should acknowledge emphatically these contributions. They are from the Government of America; as an example to other countries, and particularly to our own. America in every department of literature, science, and art, has paid explorers, the results of their labours being sent over Europe. As I have said, it is an example which Great Britian might follow.

The President—In confirmation, I may say that the books published by the American Government giving the results of the investigations of their explorers can be obtained without difficulty by any person interested. A few years ago a friend of mine in Boston, hearing that I was interested in certain matters, volunteered to get for me some volumes published but not for sale, and I thus obtained two books of great value, which could not be had for money. The thanks of our Society will be conveyed in the usual manner.

8th January, 1895.

R. Lloyd Patterson, Esq., J.P., President, in the Chair.

William Gray, Esq., C.E., M.R.I.A., read a lecture written by John J. Marshall, Esq., entitled—

OLD BELFAST: THE ORIGIN AND PROGRESS OF THE CITY.

The President said before proceeding with the regular business of the evening he deemed it due to the memory of one lately called away from among them, Mr. Robert MacAdam, to make some allusion to him and his long and useful connection with that society. He was the last of those of whom he might speak as the old set connected with it. His elder brother, James MacAdam, a distinguished geologist, was one of the eight founders of the society in 1821, and he continued closely connected with it up to the time of his death in 1861. Robert Shipboy MacAdam was born in 1808, and was, therefore, at the time of his death last week in his eighty-seventh year. He was recorded as having attended a meeting of the society in the year it was founded (1821), nearly seventy-four years ago. He was elected an ordinary member in 1828, and a member of council in 1831, a position he continued to hold till 1889, a period of no less than fifty-eight years—an official connection with the society altogether without parallel. During that long period he filled many offices, such as those of secretary, treasurer, and vice-president, the latter office very frequently, but he repeatedly declined the presidency, a position it was long the wish of his fellow members he should occupy. Mr. MacAdam was educated at the Royal Academical Institution, and brought

up to business in Belfast. He early developed a taste for the study of Irish antiquities and archæology, and was one of the founders of the "Ulster Journal of Archæology," a valuable and useful publication, of which he believed he was editor, and to which he was a frequent contributor. Mr. MacAdam was an accomplished linguist, familiar with the classics, and with several modern languages. He was quite an enthusiastic Celtic scholar, and was particularly fond of the Irish language, literature, and music. As a near neighbour and intimate friend of his (the president's) father, he knew him all his life and appreciated his friendship very highly. Of late years he was but little seen in public. He had outlived all his old intimate friends and most of his contemporaries, so that there were now but few remaining who could recall the variety and charm of his conversation and his apparently inexhaustible stores of information. Mr. MacAdam died unmarried. He begged to move that, in recording their own regret at Mr. MacAdam's removal, the society should at the same time wish to convey to his relatives and friends their sympathy with them in their loss; and that the honorary secretary be requested to forward a copy of that resolution to Miss MacAdam.

Mr. Wm. Boyd seconded the motion, which was passed unanimously.

Mr. Robert M. Young, B.A., M.R.I.A. (honorary secretary), gave a brief description of three sepulchral urns presented to the society by Miss Watson, Killinchy, and Mr. Robert Corry, Sandown, the Knock. He said that although their Museum contained a number of fine specimens of Irish cinerary urns, it had usually happened that they were found by labourers whose first instinct was to break them in order to secure the treasure popularly supposed to be hidden in those "crocks of gold." Consequently little attention was paid to the manner of their occurrence in the soil, or even to their exact locality. The importance of a careful inspection when such excavations were either undertaken or occurred accidentally, was pointed out by Sir William Wilde in his admirable catalogue of the Royal Irish Academy.

In the case of the urns under consideration now an opportunity happily occurred of inspecting the respective localities where discovered. In May, 1893, Mr. W. Swanston, F.G.S., informed him (the honorary secretary) that an urn had been just dug up at Killinchy, and the Misses Watson, on whose land it was found, believed that another urn was still *in situ*. Accordingly, Messrs. Lavens M. Ewart and W. Swanston accompanied him to the place, and they had the great pleasure of unearthing the second urn themselves from the spot where it had been deposited many hundred years ago. By the kindness of the Misses Watson, both those urns were now in the Museum. Mr. Swanston took several photographs as the excavations proceeded, which showed its various stages. The locality was on a sloping ploughed field, 200 yards from the residence of the Misses Watson. Both urns were close together, covered by about one foot of earth. The first was inverted, and full of calcined bones, charcoal, and humus. It was broken by the spade of the labourer, who was bitterly disappointed when only "a wheen of auld banes" was found. A curiously curved bone needle, with eyelet at one end, was discovered amongst the contents of the urn. In excavating the second urn, which was erect, and filled with similar bones, care was taken to remove the adjacent soil very gently, and cord was wrapped tightly around it. Before lifting it a photograph was taken, and by leaving it untouched for some months in the hamper in which it was brought to Belfast a gradual hardening of the surface took place, which had resulted in a satisfactory specimen. Nothing was found in the surrounding soil but a few fragments of flint. The first urn measured thirteen inches in height, by twelve inches across the mouth, and was vase-shaped, with two projecting hoops dividing into three zones. The upper zone was ornamented by several panels, alternately plain and scratched with close horizontal lines. The second urn was not so coarsely made, and was ten inches high by eleven inches across the lip. It was divided into three zones, like the former, the upper or top zone being ornamented by a continuous chevron scratched in low relief.

Although the urn discovered on Mr. Robert Corry's property, at Sandown, the Knock, was about the same distance under the surface, it differed in several respects from the former specimen. It measured when whole (the rim was unfortunately broken off) fifteen inches in height by fifteen inches across the lip. This latter feature was flattened on the top, and ornamented by a series of parallel scratched lines. The lower end was only three inches in diameter, and had parallel scratched lines drawn across it. About half the height of the rim was adorned with rude flutings, rising from the foot upwards. Above these were three zones, slightly concave in section, and filled with rude zigzag lines, scratched with a stick, or perhaps a flint arrowhead. By the courtesy of Mr. Corry, Mr. L. M. Ewart and himself examined the site the day after the urn was found. It was not more than fifteen inches under the ground, was inverted, and full of calcined human bones, and rested on an ancient surface strewn with charcoal and small fragments of bone, amongst which he (the speaker) picked up a flint core and a stake. In one place a considerable deposit of charcoal occurred, resembling a primitive hearth. Mr. W. H. Patterson, M.R.I.A., informed him that he had picked up some fine chipped flint scrapers in that field. He might add that Mr. George Coffey had examined those urns recently, and would catalogue them as of unusual type in his forthcoming list. Mr. Young concluded by intimating donations—five medals commemorative of the marriage of the Duke of York and visit of King of Denmark to London, presented by the Corporation of London; sepulchral urn, found at Sandown, the Knock, presented by Mr. Robert Corry.

On the motion of Mr. W. Swanston, seconded by Mr. W. A. Ross, a hearty vote of thanks was passed to the donors.

Mr. Gray then proceeded with the lecture, of which the following is a synopsis :—In the earlier part of the middle ages Belfast, as town or city, did not exist. The Lagan, the Farset, and the Blackstaff wandered through peaceful solitudes, save where here and there a thin circle of smoke rising amongst the trees indicated a rath or fort, several of which ancient dwelling-

places existed on and around the site of the present city, of which that at Fortwilliam may be taken as an example. Many others existed which have disappeared, but M'Art's Fort still remains the most prominent object in our landscape. Such was the condition of the district under the rule of the O'Neills, of Clandeboye, Belfast being simply a ford at low water across the Lagan, while on the narrow tongue of land between the Farset and the Blackstaff stood a small castle or fortified pile, and nearer to its extremity a chapel, wherein travellers could offer up their prayers before venturing across the ford, which could only be crossed at low water. At this time Carrickfergus was the most important place in Ulster, and long continued the superior of Belfast. In 1571 Queen Elizabeth granted the Castle of Belfast and large tracts in Down and Antrim to Sir Thomas Smith, and in 1573 the same district was re-granted to the Earl of Essex. Although neither grantee was able to carry out the conditions attached to the grant, it involved their descendants in difficulties which lasted until the succeeding reign. While English courtiers were parcelling out the country on parchment the O'Neills still governed Clandeboye from their residence of Castlereagh, until on the occasion of a grand debauch being held, Con O'Neill sent his servants to purchase wine at Belfast, they came in collision with some English soldiers stationed in the Castle; the final result of which was the downfall of the house of O'Neill of Clandeboye.

On November 5th, 1603, Sir Arthur Chichester received a grant from James I. of the whole district, and from this practically dates the founding of the city of Belfast. He erected a castle on the site of the older one, which had passed through so many vicissitudes, and in 1612 received the title of Baron of Belfast. The town had so far progressed that in 1613 it was created a Corporation, and probably at this time was granted a coat of arms. After this the little town progressed quietly and steadily until the breaking out of the rebellion in 1641, which caused considerable consternation in Belfast, with the result that the people of the town and neighbourhood erected a rampart for

its defence. The only time the rampart was destined to be used was when the Cromwellian forces, under Colonel Venables, captured the town from the Royalists in 1649, after a siege of four days. After this peace was the order of the day under both the Protectorate and the Merry Monarch; and a sign of our growing prosperity will be found in the erection of the Long Bridge, which was commenced in 1682, to take the place of the ford. It was erected at the joint expense of the Counties of Down and Antrim, and was barely completed when the Duke of Schomberg arrived in Belfast with an army to conduct the Irish campaign for William of Orange in 1687. On the 14th June 1690 King William himself landed at Carrickfergus, and proceeded the same day to Belfast, stopping at the Castle, which had been prepared for his reception; on his departure for Hillsborough his Majesty was overtaken by a very heavy shower of rain opposite Orangegrove, now known as Cranmore, while taking shelter under some large trees he was invited by Mr. Eccles, the proprietor, to enter his house until the shower would pass over, which he accordingly did. It is traditionally stated that the first printing press was set up in Belfast in connection with William's army.

Certainly the next most important incident in our local history was the establishment of the "Belfast News-Letter" in 1737, with which the modern history of Belfast may be said to commence. This was followed by the issue of a rival journal called "The Belfast Courant" in 1745, which, however, had but a short existence. To turn from newspapers and printing to literary men is but a step, and that step brings us to Dean Swift, who in his early days was settled near Belfast and a frequent visitor to it, while another clergyman eminent in a different direction, was John Wesley, who often preached in Belfast during the latter part of the eighteenth century. With the exception of the scare which resulted from the capture of Carrickfergus by the French, when Belfast was menaced and ordered to send provisions to the invaders, nothing of any note occurred until the commotion caused by the invasion of the

Hearts of Steel in 1770. The disturbance was of agrarian origin, and more immediately due to the arrest of David Douglas, a farmer of Templepatrick, by Waddell Cunningham, a leading citizen, on a charge of houghing some cattle belonging to Mr. Gregg. The insurgents wrecked Mr Gregg's house, and threatened to burn the town, when through the meditation of Dr. Halliday, the prisoner was given up to them, and they retired in triumph. We now come to one of the most interesting epochs in Belfast history, the Volunteer movement, which had its origin here, and which exercised such a widespread influence upon our country. As the centre of this movement there was a review held annually, usually with the Earl of Charlemont, the Commander-in-Chief of the Volunteers, as reviewing general. The Volunteers flourished for a few years, and achieved many political reforms, after which a Republican spirit crept into their ranks and coloured their actions, which naturally caused them to be looked upon with disfavour by the authorities, and their former services were forgotten. By this time they had reached the parting of the ways, the more moderate amongst them taking the side of the Government, which only served to strengthen the sentiment of others in favour of a Republic. The consequence of this was that the Volunteers were gradually merged in the United Irishmen, which society was inaugurated in Belfast in 1791, having for its object the complete reform of Parliament and political freedom for all Irishmen without respect to their religion, and for the advocacy of these opinions the famous "Northern Star" newspaper was founded. Amongst the principal leaders of the movement in Belfast were Henry Joy M'Cracken, Samuel Nelson, Thomas Russell, and the brothers Simms, while Wolfe Tone was a frequent visitor to the town to help on the movement. Republican ideas gained ground rapidly in Belfast, with the result that in 1793, the Government issued a proclamation dissolving the Volunteers, and strengthening the garrison with a large number of troops, the whole under the command of General Lake. This vigorous action on the part of the executive had the effect of driving an

open political organisation into underground channels, the final result of which was the abortive rebellion of 1798, which owing to the precautions taken by the Government, Belfast passed through without bloodshed.

This brings to a close one of the saddest periods in Belfast history, and through the political exertions of Lord Castlereagh the 1st of January 1801 was to see the Union Jack floating over the old market house as the symbol of a new era, which was destined to be unexampled for progress and prosperity in the annals of our city. That the stormy period through which the town had passed had not materially retarded its progress was largely owing to the employment afforded by the linen industry, hand-loom weaving being practised in almost every household, while the spinning wheel, which is now but a curiosity, was then an article of furniture. With the application of steam-power machinery to the production of linen the trade was revolutionised, transferring the making of linens from the home of the weaver to the factory, as the industry is carried on to-day, leaving as a landmark of the past the old Brown Linen Hall, with its pavements and standings grass-grown and deserted, and the White Linen Hall, shortly to be taken down. Another industry which took root early in the century in Belfast was shipbuilding, a notable example being the launch of the Aurora, the first steamship built and engined in Belfast, which event took place in the year 1839. She was intended for the trade between Belfast and the Clyde, and was the pioneer of our efficient cross-channel fleet of to-day, and of the shipbuilding industry which was to develop in our days, until shipbuilding in Belfast has reached the highest point of naval architecture. Belfast was thus achieving peaceful commercial triumphs when O'Connell in furtherance of the repeal movement visited it in 1841. Dr. Cooke seized the opportunity to challenge him to a public discussion of the question, which O'Connell declined on the ground that as Dr. Cooke was the leader of the Presbyterians, to enter into a controversy with him would appear as if he was opposed to the Presbyterians, whereas in reality he was their very good friend.

The important event which created a stir in the quiet waters of our local history was the visit of her Majesty the Queen to Belfast in 1849, the town being profusely decorated in honour of the event, and the visit an unqualified success. With the march of improvement and the rapid growth of the town during recent years many interesting and historic buildings have passed away, while some still remain. One of these landmarks of the past is the old Exchange, which still stands in somewhat altered form at what was known as "the four corners," opposite Bridge Street; another was the House of Correction, which stood at the corner of Howard Street, of which only the boundary wall remains, while the Old Theatre erected in Arthur Square, in 1792, was taken down to make room for the present structure in 1871. Arthur Square itself has greatly changed during the last thirty years; indeed, to one absent for a lengthened period the town is hardly recognisable, one of the most striking improvements being the laying out of Royal Avenue on the site of Hercules Street, while the erection of the present Albert Bridge, to take the place of that which give way in September, 1886, has contributed greatly to the improvement of that part of the city. Our modern ideas of convenience and improved knowledge of sanitary laws in effecting the removal of old buildings, the widening of streets, and the clearing of congested areas has produced such a change as renders old Belfast but a memory, which antiquarian and historian may labour to preserve, but there is no reason to regret that it has been succeeded by the stately streets and modern mansions, with their many comforts, which constitute the Belfast of to-day.

On the proposition of Mr. John Malone, seconded by Mr. John Horner, votes of thanks were accorded to Messrs. Gray, Marshall, and Allen.

The meeting then concluded.

5th February, 1895.

W. Swanston, Esq., Vice-President, in the Chair.

Dr. John MacCormac gave a Lecture on

EDUCATION AND INNERVATION.

The Lecturer said—In his inaugural address to the students of the University of St. Andrew's, the late John Stuart Mill said of education—"Not only does it include whatever we do for ourselves, and whatever is done for us by others, for the express purpose of bringing us somewhat nearer to the perfection of our nature; it does more; in its largest acceptation, it comprehends even the indirect efforts produced on character and on the human faculties by things of which the purposes are quite different; by laws, by forms of government, by the industrial arts, by modes of social life; nay, even by physical facts not dependent on human will, by climate, soil, and local position. Whatever helps to shape the human being, to make the individual what he is, or hinder him from being what he is not, is part of his education." The development of the true man in the way most suited to his most peculiar characteristics should, therefore, be the highest and most important consideration of every man, who has the welfare of his species or country at heart, for the general problem in this broadest of all questions for solution appears to me to be presented to us in one word—namely, education. Now the function of education may be briefly stated as the preparation for complete living, and this is evidently what Mill meant when he uttered the words to which I have drawn attention. For to know in what way to

manage our affairs, in what way to treat the body, in what way to treat the mind, in what way to fulfil the duties of a parent or a citizen, in what way to utilise those sources of happiness which nature supplies ; in short, how to use all our faculties to the greatest advantage of ourselves and others, that is, how to live completely, is the true function of education. Now the development of the various activities which constitute human life may be classified under three heads—viz., Physical, Intellectual, and Moral Education, and though at different stages these three sections may be said to shade off into each other and blend together, yet the initial steps in each may be treated as distinct and clearly defined. And to understand the nature of each it is necessary to have a clear idea of the ultimate issue, towards which the necessary activities in each are tending. In physical education the special object is the functional development of all the organic aptitudes of the system. Intellectual education aims at the development and training of those faculties by which man is enabled to derive the utmost advantage from his environment, and to become himself a centre of activity in mental operations. By moral education may be understood this very broad principle, that effect follows cause, that the true consequences of conduct cannot be warded off, intensified, or ignored. How to secure the most effective system of training in order to accomplish these various objects has engaged the attention of the learned and thoughtful from the earliest times to the present day, and it must be confessed that the success achieved has not always been the highest and most complete possible. That mistakes have been made, even the greatest enthusiasts in the cause of education must admit, and my object to-night, if possible, is to put before you some considerations, to which, if due attention be paid, we may look for greater success in the future. It is unfortunately the case that the influence of the nervous system in physical, intellectual, and moral training has been either lost sight of or ignored, and so failures have had to be recorded What I wish, therefore, to set before you is the intimate relationship existing between the development of

powers, qualities, and characters, and the nervous system, or going to the root of the matter between education and innervation.

Let us consider the physical training which is necessary to promote the most favourable conditions under which these may be developed to the greatest perfection. One of the most flagrant vices of modern education is the abnormal development of the mental faculties to the exclusion of physical training, and, I think, a few moments consideration cannot fail to convince us of the great danger which we are incurring under this head, and how there is a possibility of our handing down a generation physically inferior to ourselves and immensely so to our predecessors. Not that I would advocate a lessening of mental culture, but with the cultivation of the mind, the proper culture of the body also, so that there may be in our children a "Mens sana in corpore sano." That this warning is not unnecessary I will give you, in support of what I have said, the substance of the remarks of an eminent scientist, Dr. Crichton Browne, on this point. In writing to "The Times" in reference to the appearance of some lady students, Girton girls, whom he saw waiting at a roadside station, he remarked on the contracted chests, high shoulders, spectacled noses, and hardened features of these young ladies, and warned the readers of that journal that excessive study might seriously detract from that personal beauty and attractiveness for which English girls were famous. Moreover, it was also pointed out that, as the consequences of excessive study unmixed with a proper amount of physical training were so serious, young ladies should hesitate seriously before they ran the risk of losing those charms which rendered them so attractive to the other sex. Now such a disaster is largely due to the fatal ignorance of what is needful for the development of the body, and to a careless disregard for the physical culture of the young. To go back to the source of this ignorance, and hence to the cause of much irreparable mischief that is produced in the constitutions of our children, how many young people, who undertake the responsi-

bility of bringing into the world those who are by and by to take their places, have the faintest idea of the duties devolving upon them? They have not the slightest conception that upon the early treatment of their offspring depends, if not the question of their life and death, at least their moral welfare or their ruin. To judge by analogy, just imagine what would be the result if an individual were to set up in business as an accountant, who had not even a smattering knowledge of arithmetic or bookkeeping; or if a man undertook to pilot a ship when he knew nothing whatever about the course of the channel, or the whereabouts of the rocks or shoals which lay hidden beneath the billows; or imagine the absurdity of a man setting up as a medical practitioner whose knowledge of anatomy or physiology was of the crudest description, or whose acquaintance with the properties of drugs was based upon the slightest and most casual observation! Truly we should wonder at this audacity and feel the utmost pity for his patients. And yet that the lives and well-being of the little ones are at the mercy of those whose knowledge of their duties and responsibilities is as a rule of the most elementary character causes neither uneasiness nor even surprise, is one of the most astonishing facts of modern experience. This point is a very important one, and deserves a whole evening for its consideration, but I can do but little more than just refer to it here. To quote the words of a very eminent educationalist—"The regimen to which children are subject is hourly telling upon them to their life-long injury or benefit, so as there are twenty ways of going wrong to one way of going right, it is not a very difficult process to form some idea of the enormous mischief done everywhere by the thoughtless, ignorant, haphazard system that prevails among us." Here again, I am afraid I must specialise a little, for since regimen is really that which determines the conditions of circulation, of waste, and of general nutrition, these in their turn act and react upon the nervous system. The various exercises contributing to these may be divided into sensory, intellectual, muscular, and affective. The

sensory are those which serve to conveniently develop and perfect the organs of sight, hearing, smell, taste, and touch; the intellectual, those which have for their aim the functional development of the organs of locomotion, of prehension and speech; the affective, those which tend to influence certain organic modifications required in the development of health, physique, and character. Now everyone knows that the sensations are so much more distinct, so much less confused, and so much more diversified as the sensory organs have been better exercised. This may be especially seen in the case of painters, in whom the organ of sight is especially trained, in musicians whose ear is taught to detect the faintest variation of tone, in handicraftsmen in whom, what has been called the great knowledge-giver, the power of touch is developed and perfected. The development of the organs of smell and taste is practically of the same character as that of touch, so that the five senses have not inaptly been termed the five gateways of knowledge. But in connection with innervation this power of touch is so important that I should like to refer you to a remark of Sir James Crichton-Browne on the "Training of the Hand." He says—"Brain motor centres are taking an indispensable share in our mental life, and mind would be as impossible without them as would be the circulation of the blood without one ventricle of the heart, and, besides this, they are constantly animating and controlling our muscular apparatus in all its intelligent applications. It is plain, then, that the highest possible functional activity of these centres is a thing to be aimed at with a view to general mental power, as well as with a view to muscular expertness, and as the hand centres hold a prominent place among the motor centres, and are in relation with an organ which, in prehension, in touch, and in a thousand different combinations of movement, adds enormously to our intellectual resources, besides enabling us to give almost unlimited expression to our thoughts and sentiments, it is plain that the highest possible functional activity of these hand centres is of paramount importance not less to mental grasp

than to industrial success." Again the cerebral functions develop with intellectual exercise as the sensory functions develop with the renewal of sensations, and just as the organs of locomotion do with the exercise of voluntary movements. At the same time, these exercises in different ways separately and collectively expend the nervous and arterial elements of nervosity. The muscular differ from the intellectual insomuch as the latter cause a more enervating waste, and one that requires for reparation more lengthened rest and sleep. Those who are habitually given to violent muscular exercises require more frequent aliment, and that of a more substantial and less delicate character than those who devote themselves to intellectual pursuits, while these ought to take food less frequently, less copiously, and that of a more juicy character than the others. It must also be borne in mind that cessation from toil is repose for the muscles, while sleep is repose for the brain. Hence the student requires a more refined diet and more sleep than the farmer. Now, to deny the suitable food or the suitable repose in either of these cases means the development of the troubles of impressionability and innervation, or, in other words, the act of nervous superexcitation, while the continued interruption of exercises results in maintaining and increasing the superexcitability of the nervous tissue in preventing the vasculo-nervine development necessary to the proper circulation of the blood, while the too frequent renewal or too prolonged continuance of them results in producing superexcitability in the nervous tissues by debilitating them. It must, therefore, be seen how important is the variation or alternation of the different exercises in the proper balancing of the various functions and developments of nervosity.

And now a few words on the practical application of this to modern physical training. First, I would invite you to consider how those who are interested in the breeding of various animals deal with such matters. Take the boy, and did you ever find a boy who had never in his life kept a rabbit, a pigeon, or a mouse? Take the boy, then, who spends his pennies on his

pets. He also spends his thoughts upon their proper food, mating, and rearing, and he is particularly careful that his efforts shall result in the best stock in the village. Or, take the farmer, whose hopes are centred upon his pigs, sheep, or oxen. He prides himself upon securing the best breed, in giving them the most suitable food, and in developing the best animals that find their way into the country fair. So it is with the horse trainer, dog fancier, or the poultry breeder. All aim at developing the best specimen of its kind, or in making them as profitable as possible, and in doing so they pay the utmost attention to suitable food, environment, and training. Yet with the noblest of God's creatures—man—too frequently not one of these points is seriously considered. People marry and continue the species without ever giving a serious thought to the family history on either side or the most prominent physical characteristics, and then, in due course, the children are relegated to the nursery, where their diet is administered with unvarying regularity and monotonous repetition without the smallest attention or regard to physical need, porridge and milk, or tea and bread and butter. It speaks volumes for the recuperative powers of nature that so many children condemned to such a diet survive the unnatural treatment as do. Meat, fruit, and sweets in the rapidly-developing human animal are just as necessary as the proper exercise of the limbs and lungs in the pure air of heaven. Moreover, the occasional excesses in the consumption of such food when the opportunity is afforded ought to warn parents and nurses that the wants of nature must be supplied. It is the same with clothing and exercise. Without unnecessarily covering the body with innumerable wrappings, it must be protected from a persistent sensation of cold, and for their proper development and nutrition all the muscles of the body must receive their due and regular exercise. But the consideration of this part of my subject shades off into the question of intellectual training, as I have already intimated, and bearing in mind the close relationship between them, I have now to ask you to consider the intimate

connection between intellectual education and innervation, or, to put it a little more popularly, the influence of intellectual training upon the individual through the senses. Of course, as we have seen, all training must affect the individual through the senses, for the senses are the proper portals of knowledge; they form the connecting link between mind and external influences. In the beginning of my lecture I spoke of the aim of intellectual education as the development and training of those faculties by which man is enabled to derive the utmost advantage from his environment, and to himself become a centre of activity in mental operations, and now what I want to endeavour to show is that the only true method of such training is that which tends to develop all the faculties simultaneously, that which appeals to the intellectual nature through all the channels possible. In short, what I want to enforce is, that we must cultivate in our young people observation, energy, handicraft, ingenuity, so that we may give them a pursuit as well as a study.

After long ages of blindness, men at least are seeing that the spontaneous activity of the observing faculties in children has a meaning and a use. What was once thought mere purposeless action, or play, or mischief, is now recognised as the process of acquiring knowledge on which all after-knowledge is based. Hence the properly-conceived system of object lessons, for without an accurate acquaintance with the visible and tangible properties of things, our conceptions must be erroneous, our inferences fallacious, and our operations unsuccessful. Now, the cultivation of the habit of exhaustive observation is the real secret of true knowledge. Not telling what this object is, or showing some other, for that is only to teach the result of another's observations, which is a weakening rather than a strengthening process, but encouraging the developing intellect to utilise all the sensory powers. And this development of the power of observation is really a proceeding from the simple to the complex. One impression is formed, and dealt upon, and then another and another, until these are combined and

blended, and so presently a complex idea is conceived and the mind developed, and this development, like all others, is an advance from the indefinite to the definite. In common with the rest of the organism, the brain only reaches its finished structure at maturity, and in proportion as its structure is incomplete, so its actions are wanting in precision. So it has been put "like the first movements and attempts at speech, the first perceptions are extremely vague, as from a rudimentary eye, discerning only the difference between light and darkness, the progress is to an eye that distinguishes kinds and gradations of colour and details of form with the greatest exactness, so the intellect, as a whole, and in each faculty, beginning with the rudest discriminations among objects and actions advances towards discriminations of increasing nicety and distinction. To this general law our educational course and methods must conform. So the perfection of intellectual education is the utilisation of all the senses in the acquisition of knowledge, the transmission of impressions from these portals to the central office—the brain—and, as a consequence, the broadening and deepening of the powers of the mind.

We have now to consider the connection between moral education and innervation, and as to moral education, I must ask you to understand and interpret the expression in the broadest possible way—viz., that the best way to the highest moral training is that indicated by Nature herself; and that is, that effect follows cause, and hence that the consequences of conduct cannot be ignored, intensified, or avoided. Moral education, therefore, appeals directly to the common sense or intelligence of the individual, so in the first place there is an information, conveyed by means of verbal instruction, and in the second, an appeal to the mind—the affective impressionability by means of rewards and punishments. Now, the fundamental element of an instruction consists in a commandment, a precept, and we find that there exists in man a corresponding element, which is the faculty to act or abstain from action—that is, the power to will to do, or

to refrain from doing, and this is exhibited in children of even the tenderest years. This faculty may be spoken of as the plan of activity in the individual, for without such a faculty or plan he would be the creature of external influences. But it may be that there is a specific aim towards which this plan is directed. As soon as, or whenever suitable, external influences excite those sensorial or intellectual aptitudes which direct this plan, there is immediately a corresponding action on the part of the individual. For instance, if the end of activity be patriotism, and the necessary exciting influences be at work, there will be produced the boldness and indomitable energy of the soldier, or the sagacity and controlling force of the commander ; or. if it be the pursuit of science, there will be developed the patience and the careful observation of the student ; or, if it be artistic pursuits, there will be called into active energy all the qualities which produce the painter or musician. So it was by setting before the enslaved and almost hopeless Israelites the ideas of independence and freedom, that Moses, by his extraordinary genius and commanding influence, laid the foundations of the Jewish nationality, and this, too, before they had actually acquired the promised territory, and it was a similar influence that produced a Clive, a Wellington, or a Bonaparte. To a like cause may be traced the development of a Mozart or a Beethoven, of a Sidney Cooper or a Frederick Leighton.

Education of whatever kind has for its proximate end the preparation of the individual for the duties of life, but the business of moral education is to show that the consequences of an act, whether right or wrong, must be reaped by the individual. If a child touches the hot bars of the grate a burn is the consequence, or if it pricks itself with a needle or puts its hand upon a nettle pain follows, and if either act is committed again the same result is observed ; hence the act is avoided. These phenomona can hardly be called punishments, but they are simply the beneficent checks to actions which are essentially at variance with bodily welfare—the unavoidable consequences

of the deeds which they follow. They are the lessons which Nature teaches, and, to quote the well-known line, "Si naturam ducem sequemur, nunquam aberrabimus." Here, then, is a principle laid down by Nature which should influence us in the moral education of the young. Let us take one or two simple examples. A child is naturally untidy and destructive, and it is sought to correct this bad habit. Its toys are left about the floor, or wantonly destroyed. Some would content themselves with a scolding or a slight punishment, and instruct the servant to gather up the toys or the shreds, but that does not correct the tendency. The proper course is to insist upon the correction of the habit by the opposite treatment. The labour of putting things in order is the true remedy for wilfully leaving them in disorder, and the refusal to supply a new toy in the place of that wantonly destroyed. A lad damages a schoolfellow's book, he should be compelled to replace it by a sacrifice of his pocket-money. A man beats his wife, and so manifests a want of self-control or displays a brutal tendency in his nature; he should be publicly whipped by the hangman. These methods of moral culture, by the experience of normal reactions, as divinely ordained methods, are equally applicable to the youth or adult; moreover they have the following advantages:—First, they give the rational knowledge of right and wrong conduct, which arises from personal experience of the good or bad consequences which follow; secondly, by suffering the painful effects of their own wrong acts they recognise the justice of them. The principles which affect the future life are identically the same as those to which I have drawn attention; but I must not trench on the province of those whose vocation it is to set before us our duties in respect of that life. I would, however, that they, as well as all of us, should ever consider the important part played in the development of the characteristics of the individual by nervosity—the tendency of our nature which is fostered by external influences of a like character, or checked and altered by a careful attention to those of an opposite nature. By recognising this, we consider the true value of education, and

unless it is recognised the highest function of the teacher is ignored and rendered of no avail.

ANTIQUARIAN COLLECTIONS IN ULSTER.

Mr. Milligan next addressed the meeting as follows:—Mr President, ladies, and gentlemen—Within two months from the present it is proposed that an exhibition of arts and industries shall be opened within the buildings and grounds of the White Linen Hall. Ulster has long been recognised as the home of Irish manufacturing industry, and Belfast as the place in Ulster where those industries are principally concentrated. It is not intended that exhibits should be confined to Ulster, but whilst open to exhibitors from every part of Ireland and the United Kingdom, it is hoped that Ulster will be thoroughly represented, and that samples of the leading manufactures of the province will be exhibited. The cottage industries, or home manufactures, will be represented in a fitting manner also. The Irish Industries Association, founded by the Countess of Aberdeen, has been approached on this matter, and the executive of that society at once acceded to the request, and have taken space for an exhibit illustrating the work they are doing in the congested districts of this country. In the County Donegal, with the assistance of the Congested Districts Board, they have given considerable employment to the people. They have introduced a superior class of looms for weaving home-spun in wider widths, which have a better market, and offered prizes for excellence of workmanship. The result has been a much better class of work is now turned out, which commands higher prices. One of these looms will be working during the exhibition, and the process of carding and spinning the wool will be shown as it is carried on in the cottages of Donegal. The production of Irish point and other laces will be shown, together with an exhibit of all the goods for which the Industries

Association are noted, including rich embroideries, point, guipure, Limerick, and crochet lace, and homespun tweeds.

In addition to power-loom and home industry manufacture, there will be sections devoted to the arts, paintings, sculptures, natural history, and antiquities. It is the latter two branches that appeal to the members of this association, and for which we ask your co-operation and help. Celebrated as the province of Ulster is for its shipbuilding and textile manufactures, it is also notable, from an antiquarian point of view, as being the district not alone in Ireland, but in the United Kingdom, in which the greatest number of prehistoric implements of stone, flint, and bronze have been found. In proof of this, we have only to turn back to an exhibition held under this roof in the year 1852, on the occasion of the first meeting of the British Association in Belfast. On that occasion there was gathered together such a collection of Irish antiquities from this province as has never been shown since, and probably never will again. I have before me the catalogue of that collection, which was promoted by this society, and the following is extracted from the introduction to it:—"The exhibition of Irish antiquities, now in the Belfast Museum, originated with a few members of the Belfast Natural History and Philosophical Society. Being aware of the existence of numerous interesting relics throughout the Province of Ulster, they were anxious to avail themselves of the meeting of the British Association in this town for the purpose of forming an assemblage of these in the museum, which, in conjunction with those already possessed by that institution, might enable strangers from other countries to judge for themselves of the nature and extent of our ancient civilisation. It was also believed that much curious light would be thrown by such an exhibition on various obscure portions of our own history, and an impulse given to the study of archæology and the preservation of antiquities in Ireland. Circulars were sent to all the leading noblemen and gentlemen in Ulster, as well as to some in other districts. The application was responded to in a manner most gratifying to the projectors, and creditable to

the good feeling of the contributors, many of them gentlemen altogether strangers to Belfast. The result has been the assemblage of such a collection of Irish antiquities, as has perhaps never been brought together before, and such as may hardly be seen again in one place. It comprises specimens of nearly every class of antique objects ; some of extreme rarity." The catalogue extends to 59 pages, and the exhibitors from Ulster alone numbered some 40 persons. The finest and most extensive collection was shown by Mr. John Bell, of Dungannon. There were three other exhibitors from the same town, the Countess of Ranfurly, Mr. M'Clelland, and Mr. Barton. To give a slight idea of Mr. Bell's collection I may give a few items from the catalogue as follows :—250 stone Celts, 486 flint arrow heads, 200 bronze Celts, 22 bronze swords, 22 bronze skeans, 87 bronze spear heads, 9 ancient square bells, 17 querns, 24 square methers, besides bronze cauldrons, bronze pins and fibula, smoking pipes, and the seal of Turlough Lynough O'Neill. County Monaghan was well represented by Mr. Anketell, of Anketell Grove, who showed a fine collection ; Mr. Shirley, of Carrickmacross ; Doctors M'Dowell, and Young, of Monaghan. Dr. Young, afterwards on the death of Dr. M'Dowell, secured his collection, and on the death of Dr. Young, the collection was acquired by Sir John Leslie, of Glasslough Castle, where it is at present. There are a few very interesting objects in this collection—one, the bell of Cappagh, and the other a bronze sword, with a part of the original bone handle attached. Belfast was well represented by the fine collections of Mr. Carruthers and Miss Getty, as well as by those of Canon M'Ilwaine, Dr. Bryson, Dr. Stephenson, Sir Robert Bateson, and the collection of this society. A large collection was shown by Mr. Welsh, Dromore ; Mr. Bloomfield, Castlecaulfield, County Fermanagh ; and Mr. Harvey, Malin Hall, County Donegal. Almost every county in Ulster was represented on this occasion. Nearly all these collections have been scattered since. Mr. Welsh's was acquired by the Royal Irish Academy, Mr. Bell's by the National Museum, Edinburgh. The British and other English museums were enriched by several of the others.

Irish antiquities are getting scarcer year by year, and cost a great deal more now than forty to fifty years ago. A dealer in the country will now get from ten shillings to a pound for a fine flint arrow head that could have been secured for a few pence by the earlier collectors. The Royal Society of Antiquaries has been for many years educating the people to preserve their national antiquities, and the twelve hundred odd members are now in their various districts forming small collections, so that it is now extremely difficult to form a large collection. The largest private collection in Ireland at present is that of Mr. Day of Cork, who has been an ardent collector for over 30 years. The finest articles in his collection are from Ulster, including the bronze swords and weapons found in Lough Erne, and the collection of gold ornaments found on Horn Head, County Donegal. Mr. Daly has kindly consented to place any portion of his collection at the service of the committee of the exhibition. The next largest collection is that of Mr. Knowles, of Ballymena, who has the finest collection of flint and stone implements in the United Kingdom. The Rev. Dr. Buick, of Cullybackey, and Mr. Raphael, of Galgorm, have each extensive collections, particularly in flint and stone. I am sure all these gentlemen will be willing to assist also. A committee has been formed, of which Mr. Wm. Gray is president, to get up exhibits for the antiquities and natural history sections, and as these will require to be in their places before the end of March, there is no time to lose. We now ask the assistance of this society and their friends to give their valuable aid in making the exhibition as interesting as possible, so that it will illustrate the civilisation and artistic skill of the people of this country in ages long passed away. Any one who has critically examined the shrines and croziers, the gold, silver, and bronze ornaments, the beautifully formed weapons, and the exquisitely written manuscripts of the ancient Irish must at once admit that these works were the products of a naturally artistic and civilised race. In requesting contributions for this exhibition, we do not propose to confine ourselves to early or prehistoric times, but wish to have a

collection of mediæval and later art products, as old silver, china, and furniture, particularly if it have any historic association; also old lace and such articles as would interest and instruct the present generation.

5th March, 1895.

JOSEPH WRIGHT, ESQ., F.G.S., Vice-President in the Chair.

WILLIAM REDFERN KELLY, ESQ., gave a lecture on

THE GREAT MYSTERY OF STELLAR AND PLANETARY EVOLUTION.

MR. REDFERN KELLY referred in his introductory remarks to his subject as being most subtle and far-reaching in its character, embracing as it did the origin and structure so to speak of the illimitable universe, and premised that in dealing with this abstruse question he would endeavour to confine himself to those theories which are most generally accepted by the leading astronomers and scientists of the present day as to the evolution, under divine guidance, of those myriads of suns and other innumerable worlds which everywhere surround us, from such a nebulous condition of the primordial, cosmical matter as that in which we now find it in many thousands of mysterious celestial objects, which are for the most part invisible to the human eye. One of the first questions which would naturally suggest itself in considering this complex problem would be: Have we any knowledge that there exists in the vast universe any cosmical matter, in a tenuous and diffused condition, from which the stellar or planetary bodies (which we see around us in such profusion) could be or might be evolved, and to what extent could the evolution of these heavenly bodies be explained or accounted for by the operation of any physical laws at present known to us? Long before the telescope had first brought to light the many

hidden beauties and wonders of the skies several philosophers, eminent astromoners as well, had grasped the idea that the central sun of our solar system, and those far-off stars which are the suns of other systems enormously distant from us, may have been compacted into globular bodies like our own sun and celestial planets by the gradual condensation of what were termed vapours. And these speculations have to a very great extent received what may be regarded as fairly convincing proof since the introduction of that magic tube the telescope, and in more recent years the spectroscope, as well as the photographic camera, by which means we have succeeded in piercing the depths of celestial space in every conceivable direction, and to such an extent as to bring to light hosts of mysterious cloudlike objects which astronomers have termed nebulæ. The celebrated astronomer Herschel in his extensive physical researches discovered that those nebulous masses were to be found distributed through interstellar space at astounding distances from us, many of them being buried at such remote depths as to be utterly beyond the reach of even our most powerful telescopes, by which they could (where possible to get glimpse of them) only reveal themselves to us as filmy, flimsy, non-ponderable bodies, nebulous clouds, or mists of greater or less extent, the matter of which they were composed being assumed to be a chaotic description of luminous fluid, resembling to a great extent that luminous matter which is usually driven off from comets as they approach the region of our sun. A great number of the shapeless nebulæ were found to be of truly enormous extent, and among what are known as the planetary nebulæ some were found which would fill up a space fully as great as that occupied by our own sun and his entire system of planets and satellites—in point of fact, a great spherical mass, having a diameter of upwards of six thousand millions of miles. The distances at which those nebulous masses are located in space were next considered, and it was stated that they were situated at such immense distances from us that we have never yet succeeded in measuring even the distance of the nearest of those

strange bodies. Professor Bond, of Cambridge, America, has, however, ventured to ascribe to the great nebula in the constellation Andromeda a distance eqvivalent to about sixty-five years of light travel—*i.e.*, light travelling from that far-away object would then require a period of sixty-five years to reach our earth, at the enormous velocity at which we know that light does travel through the ether of space, 186,000 miles in each second, or eleven millions of miles in one minute.

The lecturer next proceeded to discuss the celebrated nebular hypothesis of the French astronomer Laplace, which was described as being a modification of the theory of the great Sir William Herschel, and which postulated that by the known laws of gravitation, and from such a partially condensed mass of primordial matter as one of those mysterious nebulæ, an entire planetary system such as our own, with its train of subordinate satellites, could be, and most probably had been produced. This great speculation of Laplace was based mainly upon the famous nebular hypothesis formulated by the German philosopher Immanuel Kant, which provided that æons of ages ago the cosmical matter which now constitutes our stars, planets, and other heavenly bodies was in a much different condition to that in which we now find it. It was diffused everywhere throughout space, instead of being gathered together and compacted into individual bodies as at present. Centres became established, towards which the cosmical matter became attracted and separate masses of the most stupendous character were thus formed. The process was repeated in each of these masses, which were thus broken up into smaller masses, and again in the smaller masses the process was still further repeated, and thus did the German philosopher Kant account for the evolution of suns and their planets and satellites. The great nebula of the Pleiades was given as an example of the isolation and compaction of the nebulous matter into stellar bodies. Laplace's theory postulated that millions of ages ago the nucleus of an enormous mass of vapour (in fact, a stupendous nebula) embraced the entire

space occupied by our solar system, extending far beyond the orbit of the outermost known planet, Neptune. This globe of gaseous matter (assumed to be the sun and his atmosphere) was imbued into a slow rotatory motion upon its own axis in process of condensation as the mass cooled down and contracted toward the centre, and as its rotatory motion would increase the equatorial parts would bulge outward, and a ring of gaseous matter would be formed which would be cast off from the contracting central body. The nucleus would continue to contract, and another and yet another nebulous ring would be cast off, and these rings would break up and become compacted together into separate globes, which would each rotate upon its axis, and in some cases would also give off rings. The primary rings cast off as above mentioned would go to form the planets, and the secondary rings to form their satellites. It was mentioned that, as this hypothesis was formulated prior to the discovery of the great principle of the conservation of energy, and before the mechanical equivalence of heat with other forms of energy had become known to scientists, it was necessary to modify the theory of Laplace to some extent. In its main features, however, this hypothesis, duly modified, may now he said to hold the field, and it certainly constitutes the basis of all our speculations upon the subject of planetary evolution from cosmical matter. The annular, spiral, elliptical, and irregular types were concisely described. The famous nebulæ to be found in the constellations Orion and Andromeda were specially illustrated by photographs, which were taken by Dr. Roberts, F.R.S., and the locations in the heavens of these interesting objects were pointed out by the lecturer.

The lecturer next dealt with the past, present, and probable future of the central sun of our solar system, comparing it with one of the stars of the Plough, or Ursa Major (the Great Bear), a beautiful star, which he said, was in its double combination forty times greater in magnitude and intensity of brilliancy than our own sun, which in its turn was one of the myriads of stars which crowd space in every conceivable direction.

Illustrations of all the most powerful telescopes in the world, past and present, were next shown, among which were Herschel's great 40ft. telescope, the leviathan reflector of Parsonstown (Earl of Rosse's), the Paris Observatory instruments, the great Lick telescope on Mount Hamilton, California, and the great Yerkes telescope, now the largest and most powerful refractor telescope in the whole world. An example was also shown of the observatory which has recently been erected and equipped on the top of Mont Blanc, almost three miles above the level of the sea.

Mr. JAFFE—I have pleasure in asking this meeting to request the Chairman to convey our thanks to Mr. Kelly for the excellent lecture which he has given. The time and labour necessary to collect such facts as he has put before us must have been enormous; but, as our chairman has remarked, the crowded state of the house, and the close attention of the audience during the entire lecture, will repay Mr. Kelly for the trouble he has taken. He will probably excuse me if I indirectly convey our thanks to another gentleman whose name he has mentioned several times—Mr. Wilson. I am sure we all very much appreciate having seen on the screen a direct copy of a negative taken in a large telescope. There is a great difference in a lantern slide taken from a direct negative and slides made from other negatives which have been multiplied. Another point which I should like to mention is the desirability of universal time. Here we have what is known as Belfast time, and I believe very few people know what that really means. Our railways are worked according to the so-called Dublin time, and our telegraphic system by Greenwich. The western European time, as it is known, is used in Great Britain but not in Ireland; the central European time is used by Germany, Austria, Hungary, Sweden, Italy, Bosnia, Servia, and Turkey; the East European time is used by Bulgaria and Roumania. The other civilised countries, Norway, Portugal, Russia, Switzerland, and Spain are using a fixed time of their own. If the Council of this Society agree that we should petition the Government on this subject, I am sure that the

other bodies, the Corporation, the Harbour Board—in fact all the official bodies—would lend their support in endeavouring to have the English time established in Ireland. It could not be done well before May 1897, and would probably require an Act of Parliament.

Mr. Young—I believe I voice the opinions of those present when I say that we have enjoyed a highly educational treat this evening. I have much pleasure in seconding Mr. Jaffe's motion that our best thanks be given to the lecturer.

Mr. Kelly—I esteem it an honour to have the opportunity of lecturing before the members of the Belfast Natural History and Philosophical Society. I am exceedingly pleased to think that my lecture has been so well appreciated. It is the first time I have given this lecture, and as our chairman has very truly said there is a considerable amount of labour connected with it, but to me it is a labour of love. With regard to the reference Mr. Jaffe made to Mr. Wilson, I have already thanked that gentleman privately, but I now take the opportunity of doing so publicly, for his kindness in presenting me with two of his lantern slides. I agree with Mr. Jaffe that universal time would be a most desirable thing. I sincerely hope the matter will be taken up by this Society and the leading public bodies with the view of bringing about the desired reform.

2nd April, 1895.

R. Lloyd Patterson, Esq., J.P., President of the Society, in the Chair.

James Wilson, Esq., M.E., delivered a Lecture on

THE ALPS, WITH ROPE AND AXE.

Mr. Wilson said the record he was giving was an original record of climbing in Switzerland, and had nothing to do with the ordinary record of what was placed before the public in regard to Switzerland. Mr. Wilson then gave his experiences of mountaineering in Switzerland, devoting a good deal of time to the description of the clothing and accoutrements necessary for the proper climbing of the mountains. The experiences related were most interesting, and were of such a character as showed the difficulties which had to be faced by anyone attempting to climb the great peaks of the Alps. The lecture was of a most interesting description, and was illustrated with a large number of views showing the principal mountains in Switzerland and incidents in connection with the climbing of the same.

At the close of the lecture Professor Everett expressed the thanks of the audience to Mr. Wilson for the interesting and instructive lecture to which they had listened.

Mr. Wilson briefly acknowledged the vote, and the proceedings terminated.

BELFAST

Natural History & Philosophical Society.

Officers and Council of Management for 1895-96.

President:

ROBERT LLOYD PATTERSON, Esq., J.P., F.L.S.

Vice-Presidents:

JOHN BROWN, Esq.
PROF. M. F. FITZGERALD, B.A.
J. A. LINDSAY, Esq., M.D., M.A.
WM. SWANSTON, Esq., F.G.S.

Hon. Treasurer:

JOHN BROWN, Esq.

Hon. Librarian:

THOMAS WORKMAN, Esq., J.P.

Hon. Secretary:

ROBERT M. YOUNG, Esq., B.A., J.P., M.R.I.A.

Council:

JOHN BROWN, Esq.
PROFESSOR J. D. EVERETT, F.R.S., D.C.L.
LAVENS M. EWART, Esq., J.P., M.R.I.A.
PROFESSOR M. F. FITZGERALD, B.A., M.I.M.E.
JOHN H. GREENHILL, Esq., Mus.Bac.
JOHN HORNER, Esq.
JAMES A. LINDSAY, Esq , M.D., M.R.C.P.Lond.
R. LLOYD PATTERSON, Esq., J.P., F.L.S.,
WM. H. PATTERSON, Esq., M.R.I.A.
THOMAS F. SHILLINGTON, Esq.
WM. SWANSTON, Esq., F.G.S.
THOMAS WORKMAN, Esq., J.P.
JOSEPH WRIGHT, Esq., F.G.S.
ROBERT YOUNG, Esq., J.P., C.E.
R, M. YOUNG, Esq., B.A., J.P., M.R.I.A.

SHAREHOLDERS.

[*Denotes holders of three or more Shares.]

*Alexander, Francis, B.E.,	
Allworthy, Edward, Mosaphir,	Belfast.
Anderson, John, J.P., F.G.S., East Hillbrook,	Holywood.
Andrew, John J., L.D.S., R.C.S., Eng., Belgravia,	Belfast.
Andrews, Miss Elizabeth, College Gardens,	do.
Andrews, George, J.P., Ardoyne,	do.
Andrews, Samuel, J.P.,	do.
Armstrong, Thomas, jun., Donegall Square West,	do.
Barbour, James, J.P., Ardville, Marino,	Holywood.
Beattie, Rev. A. Hamilton,	Portglenone.
Bigger, Francis J., Ardrie, Antrim Road,	Belfast.
Bland, Robert H., J.P.,	Lisburn.
Bottomley, Henry H., Salisbury Avenue,	Belfast.
Boyd, William, Great Victoria Street,	do.
Boyd, William Sinclair, Ravenscroft, Bloomfield	do.
Braddell, Edward, The Limes, Malone Park,	do.
Brett, Charles H., Gretton Villa South, Malone Road,	do.
Brett, John H., C.E., Fortwilliam Park,	do.
Bristow, James R., Lismore, Windsor Avenue,	do.
Brown, John, Edenderry House, Shaw's Bridge,	do.
Brown William K. (Representatives of),	do.
Bulloch, Alexander, Eversleigh,	do.
Burden, Henry, M.D., M.R.I.A., (Representatives of),	do.
Burnett, John R., Rostellan, Malone Road,	do.
Byers, Professor John W., M.A., M.D., University Road,	do.
Calwell, Alexander M'D.,	do.
Calwell, William, M.A., M.D., College Square North,	do.
*Campbell, Miss Anna, Tobernauilt, Windsor,	do.

Campbell, John, (Representatives of) College Gardens, do.
Carlisle, A. M., Elmwood House, do.
Carr, A. H. R., Skipper Street, do.
Carson, John, Walmer Terrace, Holywood.
*Charley, Phineas H., Bangor, Co. Down.
Clark, George S., Dunlambert, Belfast.
Clarke, George H., J.P., Roseville, Lisburn.
Coates, Victor, J.P., Rathmore, Dunmurry.
Connor, Charles C., M.A., Queen's Elms, Belfast.
Cowan, P. C., M.I.C.E., College Gardens, do.
Crawford, William, Mount Randal, do.
Crawford, William, Calendar Street, do.
Cuming, Professor James, M.A., M.D., Wellington Place, do.
Cunningham, Professor R. O., M.D., F.L.S.,
F.G.S., Montpelier, Malone Road, do.

Davies, John H., Glenmore Cottage, Lisburn.
*Deramore, Lord, D.L., (Representatives of) Newtownbreda.
Dods, Robert, B.A., Dunluce Terrace, Belfast.
*Donegall, Marquis of, do.
*Downshire, Marquis of, The Castle, Hillsborough.
Drennan, W. H., Fountain Street, Belfast.
Dudley, Rev. Freeman, B.A., The Rectory, Kilkeel.
Duffin, Adam, LL.D., University Square, Belfast.
Dunleath, Lord, D.L., Ballywalter Park, Ballywalter.

Everett, Professor Joseph D., M.A., D.C.L., F.R.S.,
Derrievolgie Avenue, Belfast.
Ewart, G. Herbert, Firmount, Antrim Road, Belfast.
Ewart, Lavens M., J.P., M.R.I.A., Glenbank House, do.
Ewart, Sir Wm. Quartus, Bart, J.P., Glenmachan House, do.

Fagan. John, F.R.C.S.I., J.P., Great Victoria Street, do.
*Fenton, Francis G., Ligoniel.
Ferguson, Godfrey W., Donegall Park, Belfast.
Finlay, Robert H. F., Hughenden Avenue, do.

Finlay, William Laird, J.P., St. Clair, Windsor, Belfast.
Fitzgerald, Professor Maurice F., B.A., M.I.C.E.,
Assoc. M.I.M.E., Eglantine Avenue, do.
*Getty, Edmund (Representatives of), Belfast.
Gibson, Andrew, Cliftonville Avenue, do.
Girdwood, Miss Catherine, Mountpleasant, do.
Gordon, Robert W., J.P., Bangor, Co. Down.
Graham, Thomas, J.P, Holywood.
*Grainger, Rev. Canon, D.D., M.R.I.A. (Reps. of), Belfast.
Gray, William, M.R.I.A., Mountcharles, do.
Greenhill, John H., Mus.Bac., Fortwilliam Park, do.
Greer, Thomas, J.P., M.R.I.A., Seapark, Carrickfergus.

*Hall, Frederick H., Waterford.
*Hamilton, Hill, J.P. (Representatives of), Belfast.
Harland, Sir E. J., Bart., J.P., M.P., Baroda House,
Kensington Palace Gardens, London.
Heburn, William (Representatives of), Belfast.
Henderson, Miss Anna S., Bangor.
Henderson, James, J.P., M.A., Oakley,
Windsor Avenue, Belfast.
Henderson, Robert, Piccadilly, London.
Herdman, John, J.P., Carricklee House, Strabane.
*Herdman, Robert Ernest, Cultra.
Heyn, James, A.M., Strandtown House, Belfast.
Hind, John, jun., Cliftonpark Avenue, Belfast.
Hodges, Professor John F., M.D., F.C.S., F.I.C., J.P.,
Sandringham, do.
Hogg, John, Academy Street, do.
Horner, John, Mount Clifton, Cliftonville, do.
*Houston, John Blakiston, J.P., V.L., Orangefield, do.
*Hughes, Edwin, Mertoun, Holywood.
Hyndman, Hugh, LL.D., Ardenlee, Ravenhill Road, Belfast.

Inglis, James, J.P., Abbeyville, Whiteabbey.

Jackson, A. T., Tighnabruaich, Derryvolgie Avenue, Belfast.
Jaffé, Alfred, J.P., Cloona, Dunmurry.
Jaffé, Otto, Kin Edar, Strandtown, Belfast.
Johnston, Samuel A., J.P., Dalriada, Whiteabbey.

Kennedy, James, J.P., Richmond Lodge, Belfast.
Kennedy, William, (Representatives of) do.
Kertland, Edwin H., Malone House, do.
Kidd, George, J.P., Lisnatore, Dunmurry.
*Kinghan, Rev. John, (Representatives of), Belfast.
Kyle, Robert Alexander, Cliftonville, do.

Lanyon, John, C.E., Lisbreen, Fortwilliam Park, do.
Larmor, Joseph, M.A., F.R.S., St. John's College, Cambridge.
Leathem, John G., Victoria Gardens, Windsor Park, Belfast.
Lemon, Archibald Dunlap, J.P., Edgecumbe, Strandtown, do.
Lepper, F. R., Elsinore, Carnalea, Co. Down.
Letts, Professor E. A., Ph.D., F.C.S., Aronmore, Craigavad.
Lindsay, James A., M.A., M.D., Victoria Place, Belfast.
Lytle, David B., J.P., Bloomfield House, do.
Lytle, Joseph H., J.P., Ashleigh, Windsor Avenue, do.

Macassey, L. Livingstone, B.L., M.I.C.E., Stanley House, Holywood.
Macfarlane, John, Bladon Park, Belfast.
Mackenzie, John, C.E., Malone, do.
*Macrory, A. J., (Representatives of), do.
Magill, J. E., Easton Terrace, Cliftonville, do.
Malcolm, Bowman, Ashley Park, Antrim Road, do.
Maxton, James, The Elms, Strandtown. do.
Maxwell, David A., College Gardens, do.
Milligan, Seaton Forest, M.R.I.A., Alberta, Malone Road, do.
Mitchell, Robert A., Dunderave, Strandtown, do.
Montgomery, H. C., Newton Lodge, Newtownbreda.
Montgomery, H. H., Brasil Cottage, Knock, Belfast.
Montgomery, Thomas, J.P., Ballydrain House, Dunmurry.

Moore, James, The Finaghy,	Belfast.
Mullan, William, Lindisfarne, Marlborough Park,	do.
Murney, Henry, M.D., J.P., Tudor House,	Holywood.
*Murphy, Isaac James,	Armagh.
*Murphy, Joseph John, (Representatives of),	Belfast.
Murray, R. W., J.P., Fortwilliam Park,	do.
Musgrave, Edgar, Drumglass, Malone,	do.
*Musgrave, Henry, Drumglass, Malone,	Belfast.
Musgrave, James, J.P., Drumglass, Malone,	do.
MacAdam, Robert (Representatives of),	do.
M'Bride, Henry James, Glenalina,	do.
M'Bride, Samuel, Westbourne, Windsor,	do.
*M'Calmont, Robert, (Representatives of),	London.
*M'Cammon, Lieut. Col. Thomas A., Woodville,	Holywood.
M'Cance, Henry J., J.P., D.L., Larkfield,	Dunmurry.
M'Clure, Sir Thomas, Bart., J.P., D.L. (Representatives of),	
MacColl, Hector, Saxonia, Strandtown,	Belfast.
MacCormac, John, M.D., Victoria Place,	do.
M'Cormick, Hugh M'Neile, Ardmara,	Craigavad.
*M'Cracken, Francis (Representatives of),	
M'Gee, James, Woodville,	Holywood.
M'Gee, Samuel Mackey, University Street,	Belfast.
MacIlwaine, John H., Brandon Villa, Strandtown	do.
*MacLaine, Alexander, J.P., Queen's Elms,	do.
M'Neill, George, Beechleigh, Malone Road,	do.
Neill, Sharman D., Wellington Park,	Belfast.
Nicholson, Henry J., West Elmwood,	do.
O'Neill, James, M.A., College Square East,	Belfast.
*O'Rorke, Ambrose Howard, Tinnamara,	Greenisland.
Park, Rev. William, M.A., Fortwilliam Park,	Belfast.
Patterson, Edward Forbes, Penrhyn, Strandtown,	do.
Patterson, Mrs. Isabelle, Clanbrassil Terrace,	Holywood.

Patterson, Richard, J.P., Kilmore, Holywood.
*Patterson, Robert Lloyd, J.P., F.L.S., Croft House, Belfast.
Patterson, Robert, Tile Cote, Malone Park, do.
Patterson, William H., M.R.I.A., Garranard, do.
Patterson, William R., College Park East, do.
Pim, Edward, W., J.P., Elmwood Terrace, do.
Pim, Joshua, Slieve-na-Failthe, Whiteabbey.
*Pirrie, Miss Elizabeth, Belfast.
Pooler, Rev. L. A., B.D., Lake Cottage, Downpatrick.
Praeger, Robert Lloyd, B.A., M.R.I.A., National Library, Dublin.
Purser, Professor John, LL.D., M.R.I.A., Queen's College, Belfast.

Rea, John Henry, M.D., Shaftesbury Square, do.
Rea, William R., Gardha, Fortwilliam Park, do.
Reade, Robert H., J.P., Wilmont, Dunmurry.
Riddel, William, J.P., Beechmount, Belfast.
Robertson, William, J.P., Netherleigh, Strandtown, do.
Robinson, John, Cliftonville Avenue, do.

Scott, R. Taylor, Richmond Villa, Derryvolgie Avenue, do.
Sheldon, Charles, M.A., D.Lit., B.Sc., Royal Academical Institution, do.
Shillington, Thomas Foulkes, Dromart, Antrim Road, do.
Simms, Felix Booth, Prospect Terrace, do.
Sinclair, Thomas, M.A., J.P., D.L., Hopefield, do.
Sinclair, Professor Thomas, M.D., F.R.C.S.Eng., Howard Street, do.
Smith, John, Garmoyle Terrace, York Road, do.
Smyth, John, M.A., C.E., Milltown, Banbridge.
Speers, Adam, B.Sc., Riversdale, Holywood.
Steen, Robert, Ph.D. (Representatives of), Belfast.
Steen, William, B.A., B.L., Northern Bank, Victoria St., do.
Stelfox, James, Oakleigh, Ormeau Park, do.
Swanston, William, F.G.S., Cliftonville Avenue, do.

*Tennent, Robert (Representatives of), Rushpark,	Belfast.
*Tennent, Robert James (Representatives of), Rushpark,	do.
Thompson, E. M'C., Waring Street,	do.
*Thompson, James, J.P., Macedon,	Whiteabbey.
Torrens, Mrs. Sarah H., (Representatives of),	do.
*Turnley, John (Representatives of),	
Valentine, G. F., Sandhurst, Knock,	Belfast.
Walkington, Mrs., Thornhill, Malone,	Belfast.
Walkington, Thomas R., Edenvale, Strandtown,	do.
Wallace, John, Chlorine Gardens, Malone Road,	do.
Ward, Francis D., J.P., M.R.I.A., Wyncroft, Adelaide Park,	do.
Ward, Isaac W., Cranbrook Terrace, Lisburn Road,	do.
Ward, John, J.P., F.S.A., Lennoxvale, Malone Road,	do.
*Webb, Richard T., Milecross House,	Newtownards.
Whitla, Professor William, M.D., J.P., College Square North,	Belfast.
Wilson, James, M.E., Oldforge,	Dunmurry.
Wilson, John K., Inch Marto, Marlborough Park,	Belfast.
Wilson, Walter H., Stranmillis House,	do.
*Wilson, W., Perceval	
*Wolff, G. W., M.P., The Den, Strandown,	do.
Workman, Francis, Bladon Park, Malone Road,	do.
Workman, John, J.P., Lismore, Windsor Avenue,	do.
Workman, Rev. Robert, M.A., Rubane House,	Glastry.
Workman, Rev. Robert, B.D., The Manse,	Newtownbreda.
Workman, R. D., The Manse,	do.
*Workman, Thomas, J.P., Craigdarragh,	Helen's Bay.
Workman, William, Nottinghill,	Belfast.
Wright, James, Lauriston, Derryvolgie Avenue,	do.
Wright, Joseph, F.G.S., Alfred Street,	do.
Young, Robert, C.E., J.P., Rathvarna,	do.
*Young, Robert Magill, B.A., J.P., M.R.I.A., Rathvarna,	do.

HONORARY MEMBER.

Stokes, Miss M., Hon. M.R.I.A., Carrig Breac, Howth, Co. Dublin.

HONORARY ASSOCIATES.

Gray, William, M.R.I.A., Mountcharles,	Belfast.
Stewart, Samuel Alex. F.B.S.Edin., Belfast Museum,	do.
Swanston, William, F.G.S., Cliftonville Avenue,	do.
Tate, Professor Ralph, F.G.S., F.L.S., Adelaide,	South Australia.
Wright, Joseph, F.G.S., Alfred Street,	Belfast.

ANNUAL SUBSCRIBERS OF TWO GUINEAS.

Belfast Banking Company Ltd.,	Belfast.
Northern Banking Company, Ltd.,	do.
Ulster Bank, Ltd.,	do.
York Street Spinning Company, Ltd.,	do.

ANNUAL SUBSCRIBERS OF ONE GUINEA.

Allen, C. E., Stormount Castle,	Dundonald.
Armstrong, William, Fortwilliam Terrace,	Belfast.
Barr, James, Beechleigh, Windsor Park,	do.
Barton, H. D. M., The Bush,	Antrim.
Boyd, John, Southview Villas, Strandtown,	Belfast.
Brown, George Herbert, Tordeevra,	Helen's Bay.
Bruce, James, J.P., D.L., Thorndale House,	Belfast.
Carr, James, Rathowen, Windsor Avenue,	do.
Cleaver, A. S., B.A., Dunraven,	do.
Craig, James, J.P., Craigavon, Strandtown,	do.
Crawford, F. H., Chlorine House, Malone Road,	do.

Dalton, J. P., M.A., Roseberry Villa, Antrim Road,	Belfast.
Davidson, S. C., Killaire House,	Crawfordsburn.
Davies, A. C., Glenmore Cottage,	Lisburn.
Dunville, Robert G., J.P., D.L., Redburn,	Holywood.
Foster, Thomas A., M.A., Clonsilla, Antrim Road,	Belfast.
Gamble, James, Royal Terrace,	do.
Green, Isaac, Ann Street,	do.
Hanna, John A., Marietta, Knock,	do.
Hazelton, W. D., Cliftonville,	do.
Higginbotham, Granby, Wellington Park,	do.
Johnston, James, Joy Dene, Antrim Road,	Belfast.
Jones, A. L., Waring Street,	do.
Jones, R. M., M.A., Royal Academical Institution,	do.
Kelly, W. Redfern, M.I.C.E., F.R.A.S., Dalriada, Malone Park,	do.
Lynn, William H., Crumlin Terrace,	do.
Malone, John, Brookvale House, Cliftonville,	do.
Matier, Alexander S., Lorne,	Craigavad.
Milligen, John, Clonavor, Strandtown,	Belfast.
Murdoch, James, Ponsonby Avenue,	do.
M'Causland, William, Cherryvale House,	do.
M'Kee, William S., Fleetwood Street,	do.
M'Knight, John P., Chichester Park,	do.
M'Laughlin, Wm. H., Brookville House,	do.
Paul, Thomas, Redcot, Knock,	do.
Raynor, Thomas, M.I.C.E., Brunswick Terrace,	Bangor.
Redfern, Professor Peter, M.D., F.R.C.S.I., Lower Crescent,	Belfast.
Ross, William A., Iva Craig,	Craigavad.

Scott, Conway, C.E., Annaville, Windsor Avenue,	Belfast.
Swiney, J. H. H., B.A., B.E., Chichester Avenue,	do.
Tate, Alexander, C.E., Longwood, Whitehouse,	do.
Taylor, Sir David, J.P., Bertha House, Windsor,	do.
Thompson, John, Castleton Brickworks,	do.
Turpin, James, Waring Street,	do.
Walkington, R. B., Carriggorm,	Helen's Bay.
Withers, James, Lawrence St.,	Belfast.
Wise, Berkeley D., C.E., Silverstream House,	Greenisland.

Report and Proceedings

OF THE

BELFAST

NATURAL HISTORY & PHILOSOPHICAL SOCIETY

FOR THE

SESSION 1895-96.

BELFAST:
PRINTED BY ALEXR. MAYNE & BOYD, 2 CORPORATION STREET
(PRINTERS TO QUEEN'S COLLEGE).

1896.

CONTENTS.

Belfast Natural History and Philosophical Society.

ESTABLISHED 1821.

SHAREHOLDERS.

1 Share in the Society		costs £7.
2 Shares	,,	cost £14.
3 Shares	,,	cost £21.

The Proprietor of 1 Share pays 10s. per annum; the Proprietor of 2 Shares pays 5s. per annum; the proprietor of 3 or more Shares stands exempt from further payment.

Shareholders are only eligible for election on the Council of Management.

MEMBERS.

There are two classes—Ordinary Members, who are expected to read papers, and Visiting Members, who, by joining under the latter title, are understood to intimate that they do not wish to read Papers. The Session for Lectures extends from November in one year till May in the succeeding one. Members, Ordinary or Visiting, pay £1 1s. per annum, due 1st November in each year.

Each Shareholder and Member has the right of personal attendance at all meetings of the Society, and of admitting a friend thereto; also of access to the Museum and Library for himself and family, with the privilege of granting admission orders for inspecting the collections to any friend not residing in Belfast.

Any further information can be obtained by application to the Secretary. It is requested that all accounts due by the Society be sent to the Treasurer.

The Museum, College Square North, is open daily from 10 till 4 o'clock. Admission for Strangers, 6d. each. The Curator is in constant attendance, and will take charge of any Donation kindly left for the Museum or Library.

Belfast Natural History and Philosophical Society.

ANNUAL REPORT, 1895.

The Annual Meeting of the Shareholders was held in the Museum, College Square North, on 22nd July, at four o'clock. Robert L. Patterson, Esq., J.P., F.L.S., President of the Society, occupied the chair, and there were also present Dr. J. A. Lindsay, Dr. John MacCormac; Messrs. Robert Young, J.P.; R. M. Young, J.P., M.R.I.A.; W. H. Patterson, M.R.I.A.; Wm. Swanston, F.G.S.; Thomas Workman, J.P.; J. H. Greenhill, Mus. Bac., John Brown, Edward F. Patterson, and John Horner.

Mr. R. M. Young (Hon. Treasurer) having read the notice convening the meeting, submitted the Council's report for the past twelve months, which stated:—"The winter Session was opened on the 5th November, 1895, in the Museum, when the President of the Society, Mr. R. Lloyd Patterson, F.L.S., delivered an address on 'The Migration of Birds,' illustrated by a series of special lantern slides. The second meeting was held on the 3rd December, when Mr. George Coffey, M.A., B.L., Dublin, kindly gave an illustrated lecture—subject, 'From Egypt to Ireland, a chapter in the History of Ornament.' The third meeting was held on the 7th January, 1896, when a lecture was kindly delivered by Mr. Joseph Barcroft, B.Sc., King's College, Cambridge, on 'The Properties of the Surface of Liquids,' illustrated by a large number of experiments. The fourth meeting was held on the 4th February, when Mr.

Seaton F. Milligan, M.R.I.A., lectured on the subject of 'Social Customs and Folk Lore of Tory, Innis Murray, and the South Islands of Aran,' illustrated by numerous limelight views and specimens. The fifth meeting was held on the 3rd March, when Mr. Conway Scott, C.E., read a paper entitled 'The Production of Ability.' The sixth meeting was arranged as a popular scientific lecture by Mr. John Brown, Hon. Treasurer, on the subject of 'Automobiles, or Horseless Carriages,' illustrated by a special series of limelight views and the exhibition of a carriage just imported from France, shown with its machinery working. This lecture was given on the 16th April in the Ulster Hall Annexe, and the chair was taken by the Right Hon. the Lord Mayor of Belfast on the invitation of the President. In addition to the members of the Society and their friends, there was a large attendance of the general public on this occasion. All the meetings of the Society were largely attended some of them inconveniently so, as the Lecture Hall in the Museum is inadequate for the accommodation of a large audience. Owing to the number of lectures provided by the Society for the Extension of University Teaching and other bodies your Council did not arrange for any series of popular scientific lectures last session. It will be observed from the Treasurer's Statement of Accounts herewith submitted, as approved by the Auditor of the Local Government Board, that the finances of the Society continue in a fairly satisfactory condition, with a balance on the right side. Nevertheless, for many obvious reasons an increased membership is much to be desired. The meetings of other kindred societies continue to be held in the Museum. These include the Belfast Naturalists' Field Club, for whom additional accommodation has been provided, the Engineers' Society, and the University Extension Society. The collections in the Museum were thrown open for inspection at a nominal sum, as customary, on the Easter holidays. Several novel exhibits, including some Röntgen ray photographs, kindly lent by Dr. Cecil Shaw, attracted much attention, and the attendance of the public was large. The

curator continues to discharge efficiently his duties, in which he has the assistance of the sub-curator, Mr. Sinclair. The Museum collection of local cretaceous fossils has been rendered more complete by the identification of specimens which hitherto could not be named with entire certainty. Dr. W. F. Hume, F.G.S., of London, kindly undertook to examine these and compare them with authentic examples. This has been done, and the fossils will now be inserted in their proper order in the collection, making an addition of some forty species to the known fauna of the Irish cretaceous rocks. There still remain a few specimens which cannot be identified with any described forms, and Dr. Hume is of opinion that some of these may be new and unpublished species. On a former occasion Dr. Hinde, F.G.S., kindly revised the Museum collection of cretaceous sponges, and gave authentic names to such as could be determined with certainty. In this connection it may be stated that our Museum shelves contain the most complete series of Irish cretaceous fossils extant. The Council desire to tender their warm thanks to the Press for their admirable reports of the Society's proceedings. In accordance with the constitution of the Society, this meeting will be asked to elect five members of Council for the ensuing year in place of the following gentlemen, who retire, but are eligible for re-election, viz.:—Messrs. John H. Greenhill, John Brown, Professor M. F. Fitzgerald, Wm. Swanston, and Joseph Wright."

Mr. John Brown (Hon. Treasurer) submitted the Financial Statement, which referred to the decrease in the Society's income, especially since 1892, and stated that the balance to be carried forward was £9 13s 2d.

The President, in moving the adoption of the Report and Statement of Accounts, said he thought the diminution of income just mentioned should receive their careful attention. The Report was pretty much of the usual character. The lectures were given in great variety, and the public attended in very considerable numbers. He would like to throw out one suggestion—viz., whether they should not initiate a movement

for another visit of the British Association to Belfast. That Association visited Belfast in 1852, and again in 1874. It was twenty-two years since the last visit, and, as that learned body were greatly in demand, if they were invited probably their Committee of Management would not be able to fix a date sooner than two or three years hence. The question, then, was whether it was now desirable to invite the British Association to this city.

Mr. Thomas Workman in seconding the motion said he quite agreed with the President that the falling off in the Society's income should be looked into, and he also thought the suggestion about the British Association should receive their earnest attention.

The Report and Financial Statement were adopted.

Mr. R. M. Young, referring to the donations which the Society had received, directed special attention to an eight-legged kid, received from Mr. Matthew Hall, of Doagh, and an Arab gun, presented by Mrs. Walton Browne.

They were both exhibited on the table, and it was agreed that the thanks of the Society should be sent to the donors of these two interesting objects, and to others from whom contributions had been received during the year.

The following five members of Council who retired by rotation were re-elected:—Mr. J. H. Greenhill, Mr. John Brown, Professor Fitzgerald, Mr. W. Swanston, and Mr. J. Wright.

Mr. John Brown moved a vote of thanks to Mr. R. L. Patterson for the able manner in which he had filled the presidential chair during the year. Both in private and public he had ruled over them with dignity, and their meetings had gone on most pleasantly under his guidance. That was the third occasion Mr. Patterson had been their President, and they would all be glad to see him coming back again.

Dr. MacCormac, in seconding the vote, also referred in eulogistic terms to Mr. Patterson, making very complimentary reference to his presidential address.

The vote was passed by acclamation.

Mr. R. L. Patterson, in acknowledging the vote, mentioned that a considerable time since he presided for two years over the Society, and it was a great pleasure to him to have now had the privilege of occupying that position for another year.

The public proceedings then concluded.

Subsequently a meeting of the Council was held, when the following appointments were made :—President, Professor Everett, F.R.S. ; Vice-Presidents, Mr. John Brown, Dr. J. A. Lindsay, Mr. W. Swanston, and Mr. Thomas Workman, J.P. ; Hon. Treasurer, Mr. John Brown ; Hon. Librarian, Mr. T. Workman ; Hon. Secretary, Mr. R. M. Young.

EDUCATIONAL ENDOWMENTS (IRELAND) ACT, 1885, 48 & 49 Vict., Ch. 78.

The Account of the Council of the Belfast Natural History and Philosophical Society, for the year ended 30th April, 1896.

Dr. **Cr.**

CHARGE.

	£	s.	d.	£	s.	d.
To Balance as per last Account				£11	8	1
,, Amount of Donations, Bequests, and other Endowments, received in the year ended 30th April, 1896				3	10	0
,, Amount of Subscriptions received in the year ended 30th April, 1896				123	3	0
,, Amount of Dividends received in the year ended 30th April, 1896				17	8	0
,, Amount of Rents received in the year ended 30th April, 1896				44	9	0
,, Amount of Fees received in the year ended 30th April, 1896				0	3	0
,, Amount realized by Sales in the year ended 30th April, 1896				0	6	0
,, Amount of Miscellaneous Receipts in the year ended 30th April, 1896 (not included in the foregoing), viz.:—						
Entrance fees at door Easter Monday	£18	2	4			
Do. do. Tuesday	4	9	5			
Do. do. from May 1, 1895, to date	19	5	3			
				41	17	0
Total				£242	4	1

DISCHARGE.

	£	s.	d.	£	s.	d.
By Amount of Payments made in the year ended 30th April, 1896, under the following headings—						
Maintenance of Premises, &c. ...	£36	10	5			
Rent and Taxes, &c.	27	13	6			
Salaries, ...	85	6	6			
				£149	10	5
Other Payments, viz.:—						
Printing and Stationery	7	11	1			
Advertising	12	19	3			
Postage and Carriage	4	4	7			
Fuel and Gas	15	19	3			
Old Post Office Sign, purchased ...	1	0	0			
Journal of Archæology	0	5	0			
Auditor's Fee	1	1	0			
Insurance	2	12	6			
Printing Report	19	16	0			
G. Coffey, Expenses	1	5	0			
Additional Cost of Endowment Scheme	1	0	0			
Irish Naturalist	2	2	0			
Photographs Purchased	3	15	0			
Expenses at Easter	7	16	10			
Deficit on Lecture Accounts ...	1	7	11			
				82	15	5
Total Payment				£232	5	10
Balance in favour of this Account as on the 30th April, 1896				9	18	3
Total				£242	4	1

N.B.—Besides the above Balance there is a sum of £400 standing to the credit of this Account in the York Street Spinning Co., Ltd., $4\frac{1}{2}$ per cent. Debenture Stock.

We certify that the above is a true Account.

R. LLOYD PATTERSON, Governor.
J. BROWN, Accounting Officer.

Dated this 21st day of May, 1896.

I certify that the foregoing Account is correct.

J. F. MAYNE, Auditor.
29th day of May, 1896.

DONATIONS TO THE MUSEUM, 1895-96.

From W. C. Heron, Esq.

Two wooden spoons made and used in Lapland.

From Mrs. Kennedy.

Old iron sign of Belfast Post Office.

From R. Cambridge, Esq.

An ancient roasting jack from Carrickfergus.

From R. J. Welch, Esq.

A number of platinotype photos of Irish antiquities, and two framed photos illustrative of Irish Ethnology.

From Lieutenant-Colonel Stone, Birmingham.

An enlarged instantaneous photo of Zulu Warriors, showing their weapons.

From W. H. M'Laughlin, Esq.

An ammonite (*A. Johnstoni*) from Lias rocks at Larne.

From F. O. Osborne, Esq.

A stone axe found at Killinchy.

From Mr. John Moore, Donaghadee.

A fresh specimen of the allice shad (*Alosa communis*), caught at Donaghadee.

From Mrs. Hewitt, Killinchy.

A lizard from New Zealand.

From W. T. Clements, Esq.

A specimen of Verde antique porphyry from the Roman forum.

From The Corporation of the City of London.

A medal struck to commemorate the opening of Tower Bridge, London, 1894.

ADDITIONS TO THE LIBRARY, 1ST MAY, 1895, TILL 1ST MAY, 1896.

ADELAIDE.—Transactions of the Royal Society of South Australia. Vol. 19, 1895. *The Society.*

AUSTIN, Texas.—Transactions of the Texas Academy of Science. Vol. 1, no. 3, 1893 ; and no. 4, 1894. *The Academy.*

BERGEN.—Bergens Museums Aarbog, for 1894-95. *The Director.*

BERLIN.—Verhandlungen der Gesellschaft für Erdkunde zu Berlin. Vol. 22, nos. 4—10, 1895 ; and vol. 23, nos. 1—3, 1896. *The Society.*

BIRMINGHAM.—Proceedings of the Birmingham Natural History and Philosophical Society. Vol. 9, part 1, 1894; and part 2, 1895. *The Society.*

BOLOGNA.—Rendiconto della R. Accademia delle Scienze dell' Istituto di Bologna. Anno. 1892-93 ; and Anno, 1893-94. *The Academy.*

BOSTON.—Memoirs of the Boston Society of Natural History. Vol. 5, nos. 1 and 2, 1895 ; and Proceedings, vol. 26, part 4, 1895. *The Society.*

BREMEN.—Abhandlungen Herausgegeben vom Naturwissenschaftlichen Vereine zu Bremen. Vol. 13, part 2 ; and Beitrage, part 1, 1895. *The Society.*

BRESLAU.—Zeitschrift für Entomologie Herausgegeben vom Verein für Schlessiche Insektenkunde zu Breslau. New Series, part 20, 1895. *The Society.*

BRIGHTON.—Report and Abstracts of the Brighton and Sussex Natural History and Philosophical Society for year 1894-95, and Catalogue of Books, 1895. *The Society.*

BRUSSELS.—Bulletin de la Société Royale de Botanique de Belgique. Vol. 33, 1894; and vol. 34, 1895. *The Society.*

CALCUTTA.—Records of the Geological Survey of India. Vol. 28, parts 2—4, 1895; and vol. 29, part 1, 1895. *The Director of the Survey.*

CAMBRIDGE.—Proceedings of the Cambridge Philosophical Society. Vol. 8, part 5, 1895; and vol. 9, part 1, 1896. *The Society.*

CAMBRIDGE, Mass.—Bulletin of the Museum of Comparative Zoology. Vol. 16, no. 15, 1895; vol. 25, no. 12, 1895; vol. 26, no. 1, 1894; and no. 2, 1895; vol. 27, nos. 1—6, 1895; and no. 7, 1896; also Annual Report of the Curator for 1894-95. *Alex. Agassiz, Curator.*

CARDIFF.—Report and Transactions of the Cardiff Naturalists' Society. Vol. 26, part 2; and vol. 27, part 1, 1895. *The Society.*

CASSEL.—Abhandlungen (40) des Vereins für Naturkunde zu Kassel, 1894-95. *The Society.*

CHRISTIANIA.—En Række Norske Bergarter af Dr. Kjerulf, 1892. *Royal University of Norway.*

DANTZIC.—Schriften der Naturforschenden Gesellschaft in Danzig. New series, vol. 9, part 1, 1896. *The Society.*

DUBLIN.—Scientific Transactions of the Royal Dublin Society. Series 2, vol. 5, parts 5—7, 1894; parts 8—11, 1895; and part 12, 1896. Proceedings, new series, vol. 8, part 3, 1894; and part 4, 1895. *The Society.*

EDINBURGH.—Proceedings of the Royal Physical Society, Session, 1894-95. *The Society.*

EMDEN.—Jahresbericht der Naturforschenden Gesellschaft in Emden, for 1893-94. *The Society.*

GENOA.—Giornale della Società di Letture e Conversazioin Scientifiche di Genova. Fasc. 1—3, 1895; and anno 18, fasc. 1. 1896. *The Society.*

GIESSEN.—Thirtieth Bericht der Oberhessischen Gesellschaft für Natur und Heilkunde, 1895. *The Society.*

GLASGOW.—Proceedings of the Philosophical Society of Glasgow. Vol. 26, 1895. *The Society.*

Transactions of the Natural History Society of Glasgow. New series, vol. 4, part 1, 1894. *The Society.*

GORLITZ.—Abhandlungen der Naturforschenden Gesellschaft zu Gorlitz. Vol. 21, 1895. *The Society.*

HALIFAX, Nova Scotia.—Proceedings and Transactions of the Nova Scotian Institute of Science. Vol. 8, part 4, 1895. *The Institute.*

HALLE. — Leopoldina Amtliches Organ der Kaiserlichen Leopoldino-Carolinischen Deutschen Akademie der Naturforscher. Vol. 30, 1894; and vol. 31, 1895. *The Academy.*

HAMBURG.—Abhandlungen aus dem Gebiete der Naturwissenschaften herausgegeben vom Naturwissenschaftlichen Verein in Hamburg. Vol. 14, 1896; also Verhandlungen, series 3, part 3, 1896. *The Society.*

IGLO, Austria-Hungary.—Jahrbuch des Ungarischen Karpathen Vereines, 22nd year, 1895. *The Society.*

KIEW.—Memoirs of the Naturalist's Society of Kiew. Vol. 13, 1894; and vol. 14, 1895. *The Society.*

LAUSANNE.—Bulletin de la Société Vaudoise des Sciences Naturelles. No. 116, 1894; and Nos. 117 and 118, 1895. *The Society.*

LEIPSIC.—Mitteilungen des Vereins für Erdkunde zu Leipzig for 1894 Wissenschaftliche Veroffentlichungen des Vereins für Erdkunde. Vol. 2, 1895. *The Society*

LEIPSIC.—Sitzungsberichte der Naturforschenden Gesellschaft zu Leipzig, 19th to 21st year, 1895.
The Society

Mitteilungen des Vereins für Erdkunde zu Leipzig for 1894. Wissenschaftliche Veroffentlichungen des Vereins für Erdkunde. Vol. 2, 1895.
The Society.

LONDON.—Memoirs of the Royal Astronomical Society. Vol. 51, 1895. *The Society.*

Report of the 65th Meeting of the British Association (Ipswich), 1895. *The Association.*

Quarterly Journal of the Geological Society of London. Vol. 51, parts 2—4, 1895; and vol. 52, part 1, 1896; also Catalogue of Geological Literature added to the Library, 2 parts, 1895.
The Society.

Journal of the Royal Microscopical Society. Nos. 106—109, 1895; and 110, 1896. *The Society.*

Transactions of the Zoological Society of London. Vol. 13, parts 10 and 11, 1895. Proceedings, part 4, 1894; and parts 1—3, 1895.
The Society.

MADISON, WIS.—Transactions of the Wisconsin Academy of Sciences. Vol. 10, 1895. *The Academy.*

MADRAS.—Report of the Madras Government Museum for 1895.
The Superintendant.

MANCHESTER.—Journal of the Manchester Geographical Society. Vol. 10, nos. 4—12, 1896; and vol. 11, nos. 1—3, 1896. *The Society.*

Transactions of the Manchester Geological Society. Vol. 23, parts 5—9, 1894-95; and vol. 24, parts 1—6, 1895-96. *The Society.*

MARSEILLES.—Annales de la Faculte des Sciences de Marseille. Vol. 4, fasc. 4, 1894; and vol. 5, fasc. 1—3, 1895.

MEXICO.—Boletin Mensual del Observatorio Meteorolgico Central, September 1895 till January, 1896. Also Boletin del Observatorio Astronomico Nacional de Tacubaya. Vol. 1, nos. 21—23; and Anuario, ano. 16, 1895. *The Director.*

MINNEAPOLIS.—Occasional Papers of the Minnesota Academy of Natural Sciences. Vol. 1, no. 1, 1895. *The Academy.*

MOSCOW.—Bulletin de la Société Impériale des Naturalistes de Moscou. Nos. 1—3, 1895; and no. 4, 1896. *The Society.*

NANTES.—Bulletin de la Société des Sciences Naturelles de l' Ouest de la France. Vol. 4, part 4, 1894; and vol. 5, parts 1—3, 1895. *The Society.*

NEW YORK.—Annals of the New York Academy of Sciences. Vol. 8. nos. 5—12; and Index, 1895. Transactions. Vol. 14, 1894-95. *The Academy.*

Bulletin of the American Geographical Society. Vol. 27, nos. 1—4, 1895. *The Society.*

ODESSA.—Memoirs of the Society of Naturalists of New Russia. Vol. 19, part 1, 1894; and part 2, 1895. *The Society.*

OPORTO.—Annaes de Sciencias Naturaes. Anno 2, nos. 3 and 4, 1895, and anno 3, no. 1, 1896. *The Editor.*

OTTAWA.—Annual Report of the Geological Survey of Canada. New Series, vol. 6, for 1892-93; Palæozic Fossils, vol. 3, part 2, 1895; and Canadian Palæontology, vol. 2, part 1. Also Maps 364—372 and 379—390; also 550 and 551; together with Easter Townships Map, Quebec, Rainy River Sheet, and Sheet no. 11, Nova Scotia. *The Director.*

PADUA.—Bullettino della Società Veneto Trentina di Scienze Naturali. Vol. 6, no. 1, 1895; and Atti. Series 2, vol. 2. fasc. 2, 1896. *The Society.*

PHILADELPHIA.—Proceedings of the Academy of Natural Sciences. Part 3, 1894; and parts 1—2, 1895. *The Academy.*

Proceedings of the American Philosophical Society. Vol. 32, no. 143, 1893; vol. 33, No. 146, 1894; and vol. 34, nos. 147 and 148, 1895. *The Society.*

Transactions of the Wagner Free Institute of Science. Vol. 3, part 3, 1895. *The Institute.*

PISA.—Atti della Società Toscana di Scienze Naturali, Processa verbali. Vol. 9, parts January to July, 1895. *The Society.*

ROCHESTER, N.Y.—Proceedings of the Rochester Academy of Science. Vol. 2, brochure 3, 1894; and brochure 4, 1895. *The Academy.*

ROME.—Journal of the British and American Archæological Society of Rome. Vol. 2, no. 5, 1895. *The Society.*

Atti della Reale Accademia dei Lincei. Series 4, vol. 4, 1st semestre, fasc 8—12, 1895; 2nd semestre, fasc 1—12, 1895. Series 5, vol. 5, fasc 1—6, 1896; also Rendiconto dell' adunanza solenne del 9th June, 1895. *The Academy.*

Bollettino della Societa Romana per gli studi Zoologici. Vol. 4, nos. 3—6, 1895; and Zoologicae Res, an. 1, No. 2, 1894. *The Society.*

SAN FRANCISCO.—Proceedings of the California Academy of Sciences. Series 2, vol. 4, part 1, 1894; and part 2, 1895; also vol. 5, part 1, 1895. *The Academy.*

STAVANGER.—Stavanger Museums Aarsberetning for 1894. *The Trustees.*

SANTIAGO DE CHILI.—Verhandlungen des Deutschen Wissenschaftlichen Vereins zu Santiago de Chile. Vol. 3, parts 1 and 2, 1895. *The Society.*

STIRLING.—Transactions of the Stirling Natural History and Archæological Society for 1894-95.
The Society.

STOCKHOLM.—Handlingar of the Royal Royal Swedish Academy. Vol. 26, 1894-95. Ofversigt, vol. 51, 1894. Bihang, vol. 20, parts 1—4, 1895; also Sveriges Zoologiska Hafsstation Kristineberg, 1895.
The Academy.

TOKIO.—Mittheilungen der Deutschen Gesellschaft für Natur und Volkerunde Ostasiens in Tokio. Vol. 6, parts 55 and 56 and supplement, 1895; and part 57, 1896. *The Society.*

UPSALA.—Bulletin of the Geological Institute of the University of Upsala. Vol. 2, part 1, no. 3.
The Institute.

VENICE.—La Notarisia-Neptunia. Vol. 10, nos. 2—4, 1895.
The Editor.

VIENNA.—Verhandlungen der Kaiserlich-Koniglichen Zoologisch-Botanischen Gesellschaft in Wien. Vol. 15, parts 4—10, 1895; and vol. 16, parts 1—3, 1896. *The Society.*

Verhandlungen der Kaiserlich-Koniglichen Geologischen Reichsanstalt for 1895. Nos. 4—18; and 1896, nos. 1—3. *The Society.*

WASHINGTON.—Report of the Secretary of Agriculture for 1893. North American Fauna, no. 8, 1895; and the Common Crow of the United States, 1895.
The Secretary of Agriculture.

Eleventh and Twelfth Annual Reports of the Bureau of Ethnology, 1894. Contributions to North American Ethnology. Vol. 9, 1893. Also the following Publications of the Bureau:—An Ancient Quarry in Indian Territory, Archæologic Investigations in James and Potomac Valleys, Chinook Texts, The Siouan Tribes of the East, and List of Publications, 1894. *The Director of the Bureau.*

Fourteenth Annual Report of the Geological Survey of the United States. Part 1, 1893; part 2, 1894. Monographs, vols. 23 and 24, 1894. Bulletins, nos. 118, 121, and 122, 1894.
The Director.

Smithsonian Report for 1893. Report of the United States National Museum for 1893. Smithsonian Contributions to Knowledge, 980 and 989, 1895. Miscellaneous Collections, nos. 854, 969, and 972, 1894; also 970 and 971, 1895. Proceedings of the United States National Museum. Vol. 17, 1895, and Bulletin no. 48, 1895; also Account of the Smithsonian Institution, 1895.
The Smithsonian Institution.

YORK.—Annual Report of the Yorkshire Philosophical Society for 1894. *The Society.*

ZURICH.—Vierteljahrsschrift der Naturforschenden Gesellschaft in Zurich, 40th year, parts 2—4, 1895; and Neujahrsblatt, No. 98, 1895. *The Society*

From ROBT. LLOYD PATTERSON, Esq., J.P., F.L.S.—Journal of the Linnean Society. Botany, vol. 30, no. 211, 1895; and vol. 31, nos. 212—214, 1895. Zoology, vol. 25, no. 161, 1895.

From DON ALBERTO SANCHEZ, San Salvador.—La Cornoide, 1895.

BELFAST

NATURAL HISTORY & PHILOSOPHICAL SOCIETY

SESSION 1895-96.

6th November, 1895.

INAUGURAL ADDRESS BY THE PRESIDENT.

Robert Lloyd Patterson, Esq., J.P., F.L.S.

The President, in opening the proceedings, said his thanks were due to his fellow-members of the Council for electing him again president of that Society, and he could only say that he should endeavour to discharge the duties connected with that position to the best of his ability. His thanks were also due to the members of the audience for their kindness in gracing by their presence the opening meeting of the session. Before proceeding with the business of the meeting, he thought it was due to the memory of two great men, who had since the Society's last meeting there been removed from the scene of their earthly labours, to make a brief allusion to those two men, who belonged to different and sometimes antagonistic nationalities—England and France. The Englishman was Professor Huxley and the Frenchman was M. Pasteur. Both adorned the countries which gave them birth; both were distinguished ornaments of the sciences of which they were accomplished exponents. It was not too much to say that the commanding genius of Huxley shed lustre on the period in which he lived, and had exerted a profound and lasting influence on the scientific thought of that period. Of M. Pasteur they knew less, except in connection with the successful result of his researches into the combating

of one of the most terrible ailments by which mankind could be attacked; he referred to hydrophobia. He was glad to learn that the Institute which grew up under his care and which bears his name would perpetuate that name to posterity. In connection with the late Professor Huxley, he might mention that a committee had been formed in London with the object of making arrangements for the erection of a national memorial to perpetuate his memory, and he (Mr. Patterson) was asked to join that committee, not in his private capacity, but as the president of that Society. He regarded the request as a compliment, and acceded to it. He was asked if he thought it desirable to form a local committee for the object stated, and he had replied that he scarcely thought it would be necessary to do so, but that he would make it known through the Press that he would be prepared to receive and acknowledge any contributions received by him for the object in view. He regretted to say, however, that this large, populous, and opulent city of Belfast had not responded, through him at least, to that appeal to the extent of one pound, one shilling, or one penny; but it was to the credit of an old and familiar Belfast gentleman and a personal friend of his and his (Mr. Patterson's family),—Mr. James Herdman, now resident in Bath—who, having seen the announcement already mentioned, sent him a contribution—and that was the only contribution through his hands that had reached the Committee.

The President then proceeded to deliver an address on "The Migration of Birds," which was effectively illustrated by a series of special photo-lantern slides shown by Mr. A. R. Hogg. Mr. Patterson commenced his paper by stating that of the large number of birds which have now—many of them in his opinion wrongly—been placed on the British list some are mere accidental stragglers; and others, although met with regularity, do not occur with sufficient frequency to be called common; so that the number of different species of our well-known everyday birds is probably considerably below 200. Of these some occur only in summer and others again only in

winter, these two sub-divisions going to form the division of migratory birds, as compared with the other division, the permanent residents. The lecture being only on the subject of migration, classification was not alluded to; so, explaining the difference and instancing some examples of the two sub-divisions just mentioned—the summer migrants and the winter migrants—the lecturer next proceeded to point out that even among our so-called permanently resident birds migration prevailed to a large extent; and he illustrated this by reference to the habits of the curlew, the starling, the skylark, and others. The questions of what began the migration movement and what leads to its continuance were next discussed at some length, and the theories of different authorities on the subject alluded to in detail. He differed from the authors whose works he referred to or quoted from, and stated his own views on these two branches of the subject. He next proceeded to give a comprehensive sketch of the great migratory movement—"the mystery of migration," as he termed it—as observed in various places, paying a high compliment to Mr. Seebohm and Mr. Harvie-Brown for their investigations in this direction. Mr. Seebohm he alluded to most particularly as having undertaken a journey of over 15,000 miles to the mouth of one of the great Siberian rivers—the Yenesei, falling into the Arctic Ocean—in his endeavours to track some of our migrants to their summer homes. The scenes witnessed by the intrepid travellers were graphically described, and were admirably illustrated by the lantern slides. Migration in the United Kingdom, but in Ireland in particular, and in Continental Europe, was next alluded to, the lecturer concluded with a description of the wonderful migration which occurs in Heligoland, as recorded in a recently-published translation of the great work on the birds of that island by a veteran resident there, Mr Gätke. The nesting habits of some of the birds were described, and views of some favourite nesting-places exhibited, these and the other views adding an artistic attraction to an interesting and instructive lecture, which was listened to with attention throughout by a most appreciative audience.

Dr. Redfern said that everyone knew that Mr. Patterson was thoroughly acquainted with this subject, but he dared say that no one was at all aware of the very lucid manner in which he was likely to bring it before them. He was sure that the very youngest present must have followed him with great pleasure. In addition to the lecture, which was filled with most instructive and interesting details, they had the pleasure of viewing a number of very handsome photographs, which would serve to engrave the lecture on their memory. It might be said that Mr. Patterson was born a Naturalist, and could not help being a Naturalist, but they could not but observe and be grateful for the trouble he had gone to in order to gather together a vast mass of information for their pleasure and instruction. He thought therefore they were entitled to give him a very hearty vote of thanks, and he had pleasure in moving that they do so.

Mr. T. F. Shillington said he had pleasure in seconding the motion.

Mr. Patterson pointed out that it was not their custom to pass votes of thanks to their own members, but he was very grateful for the kind words used by his friend Dr. Redfern and to Mr. Shillington for seconding the motion.

This concluded the proceedings.

3rd December, 1895.

Robert Lloyd Patterson, Esq., J.P., F.L.S., President, in the Chair.

Mr. George Coffey, M.A., Barrister-at-Law, M.R.I.A., of Dublin, delivered a Lecture entitled :—

"FROM EGYPT TO IRELAND—A CHAPTER IN THE HISTORY OF ORNAMENT."

The lecturer in his preliminary remarks, said that the subject which he had the honour to introduce to their notice that evening formed one of the most fascinating chapters in the history of ornament. It had an archæological and an historical interest, and it had a decorative interest. He would be engaged the greater part of the evening on the archæological and the historical aspects of the subject, and if time permitted at the close of the lecture he might be able to say a few words on the purely decorative or ornamental side of the question. It was usually assumed that primitive man in his first efforts in art began to make geometrical patterns, zigzags, geometric circles and spirals, but within the past fourteen years the subject had been studied more closely, and they now knew, so far as investigation had proceeded, that primitive man had never begun art in that way. Geometrical patterns, simple as they looked, represented an advanced stage of art, and they now recognised that primitive man began by drawing graphic and realistic representations of the things with which he was in immediate contact—in other words, of the life that existed around him, and if they considered for a moment they would recognise that was the natural beginning of any form of art.

Young children did not begin by drawing patterns or designing geometrical combinations, but what might be called very realistic representations of their near relatives—and it was at a later stage that they proceeded to take an interest in design and ornament, in combinations and beauty lines. And so it was that the earliest records that primitive man had left behind him were realistic representations of animals which he had hunted and of people round about him. Additional proof of this fact was supplied by the illustrations on the carved bones found in the caves of France left therein by the cave men. These represented the most primitive examples of art they had, and they showed a great power of grasping the actualities of the animals which they represented. Passing from realistic representations, they came to the stage when man manifested a desire to enrich the objects which he found around him in his daily life, and to apply his power of drawing to the beautifying of the object. The moment he reached that stage he was constrained and limited by the shape of the object which he was representing, and this constraining influence led him to combination lines. The forms which he at first drew realistically assumed a definite design. The design was evolved until ultimately patterns were evolved, and at the last stage they reached geometrical forms. They would see that if they went on simplifying any design they would ultimately come upon the right lines. Primitive man was now coming to the stage in which he took pleasure in the beauty of lines, and not merely in the graphic representations of things. He wanted to put before them a definite historical fact, and to interest them in what he might call the wandering of the spirals, and to show them how certain patterns had travelled across the world, and how even in Ireland, in the remote west, they found trimmings of some of those early patterns beginning in far away Egypt. Continuing, Mr. Coffey described the historical sequence of some of the most characteristic Egyptian patterns of the different dynasties. The series of slides illustrating these patterns was especially interesting, many of the patterns being

of great beauty. Passing from Egypt to pre-historic Greece, he showed several examples from the finds at Mycenæ, and traced the influence of Egyptian patterns in pre-historic Greek ornament. Then following the path of the pre-historic trade routes across Europe, he showed a series of slides exhibiting the extension of certain of the pattern forms to the Baltic, and, finally, to Britain and Ireland. The geographical distribution of spiral patterns was most remarkable, and the strict limits within which their extension across Europe was confined showed that it was not due to chance or accident, but the result of trade intercourse—a conclusion supported by other evidence. It had been usual to assume that continental influence had reached Ireland from Gaul through Britain. Mr. Coffey pointed out that in the narrow seas and islands of the Baltic a civilisation had been developed in bronze age times comparable, though lower in order, to that of the Ægean; that in early bronze age times Scandinavia had reached a higher civilization than Gaul of the same period, and that to this northern centre of influence was to be attributed important elements in the early culture of Scotland and Ireland, which had come to those countries direct by sea from the north in the bronze age.

Mr. JOHN WARD, J.P., moved that the best thanks of the meeting be given to Mr. Coffey for his fascinating and delightful paper. He said the lecturer had a way of connecting his information which made his remarks very interesting. As the subject of the lecture tended to fix their attention upon their native land, it was all the more welcome. It seemed a very wonderful thing, as Mr. Coffey had pointed out, that the golden age of Ireland, which, perhaps, might come again, should have been found out by the intercourse with Egypt. It was also rather extraordinary how all the decorative art known to us could be traced as having proceeded from certain simple original types. They had seen from the lecture how the ancient Egyptian types were found in the decorations in the Parthenon at Athens, and later in decorations of the Renaissance period. While in Egypt he had been

greatly struck by the enlaced work of the decorations there, and its similarity to that on the ancient Irish manuscripts. The decorations of every kind seemed to him to have a resemblence to the Book of Kells. He had also seen ancient ornamentation which reminded him of the shrine of St. Patrick's bell, which they used to have in Belfast. He admired the lucid way in which Mr. Coffey had traced the connections between Ireland and Egypt, and hoped, in conclusion, that the Society would have many more visits from him.

Mr. John Workman, J.P., seconded the vote of thanks, which was passed with applause.

Mr. Coffey, in acknowledging the compliment, said it was a pleasure to him to meet a number of brother archæologists, and exchange ideas with them. He did not think that any of the people working in those fields in Ireland could forget the debt they owed to the Northern archæologists. In the prehistoric department several of their men had done work that would always be classical, and it was a delight to meet kindred spirits in those studies. He would like to express the hope that in Belfast there would develop a great school of design. They had a great textile industry in this city ; they had the conditions favourable to the growth of a great school of design. If they were looking forward in that direction they must keep in mind that to develop such a school they must develop a tradition. Great schools of design had been slow in forming while in their earlier stages, and they must remember that the art of design had come down through the craftsmen as a tradition, and that the great designers who had made France what she was were men from the industries, from the workers in the textiles. If they wanted to master design they must narrow themselves in some particular school and class of work. They must create an atmosphere in their city, a tradition, and from that would come a great school of design.

Mr. Young having announced that the next lecture would be given on the 5th January by Mr. J. Barcroft, of Cambridge,

The meeting terminated.

January 7th, 1895.

ROBERT LLOYD PATTERSON, Esq., J.P., F.L.S., President, in the Chair.

MR. JOSEPH BARCROFT, of King's College, Cambridge, gave a Lecture on

"THE PROPERTIES OF THE SURFACE OF LIQUIDS."

THE PRESIDENT, in introducing the lecturer said they were assembled that evening to hear a lecture from Mr. Barcroft. His subject sounded rather technical, but he was sure he would make it very clear to them.

MR. BARCROFT then proceeded with his lecture, and prefaced his remarks by stating that, although the title of his lecture appeared to be of a somewhat technical nature, he had really chosen the subject because it was one the knowledge of which enabled us to account for a great many phenomena to be seen every day, hence one not without interest to those who took a pleasure in investigating what they saw around them. The fact that if the surface was not penetrated a needle may be made to float upon water at once shows a difference between the properties of the surface and those of the general mass of the liquid. The difference was explained by a model, in which each of the indistinguishable particles of molecules of which the water was composed was represented by a marble, from which it appeared that while a particle in the body of the water was equally attracted by particles all round it, those at the surface were only attracted downwards by those below them. All around the liquid its bounding surface is as it were compressing the water, and acts in fact just as though the water were entirely enclosed in a distended bag of india-rubber. The

resemblance between the surface film of a liquid, whether exposed to air or to the sides of the vessel, and stretched elastic was shown by some experiments. A piece of stretched elastic tends to contract; it would lift up a weight; it would, in fact, like a wound watch-spring, do work; in scientific language it possesses potential energy, energy being defined as ability to do work. Now, potential energy when created always tends to run down or become a minimum. The lifted weight will fall; the wound spring will unwind; the stretched elastic will contract; and the energy of the liquid surface tends also to become a minimum, this being effected, just as in the case of the stretched elastic, by a reduction of superficial area. This underlying principle will be found to explain many of the phenomena due to surface tension. Why, for instance, is an ordinary drop spherical? Because the sphere is that figure which has the smallest surface for its volume, and surface contraction can proceed no farther. Mr. Barcroft went on to show by experiments the application of the principles. He explained why water pouring out of a tap will sometimes remain as a falling column, while at other times the column will break up into innumerable drops. He also explained why a liquid with small surface tension, such as oil, will if poured on water, rapidly spread out into a thin film, while a liquid of large surface tension would under similar circumstances gather itself together into a compact mass. A film of water on a glass rod will gather up into a number of drops. The spider avails itself of this property of liquids in forming the necessary drops of sticky liquid on its web. This liquid is secreted by the spider as film, covering the cobweb evenly. The lecturer then proceeded to show that the influence of surface tension largely regulated some very important and familiar phenomena. He showed that the presence of smoke in the air greatly facilitated the condensation of moisture into drops, and connected this fact with the foggy atmosphere prevalent in towns. By the aid of another experiment he showed the important bearing of surface tension upon filters. When a stream of impure water

runs through one of the pores of a filter, the roughness of the material of which the filter is made detains the external part of the stream of liquid. It is a provision of surface tension that salts dissolved in the liquid tend to aggregate at the exterior rather than the centre of the stream. Hence they are caught by the filter. He proceeded to illustrate the fact that the force due to surface tension was by no means inconsiderable, contrasting it in this respect with gravitation, and demonstrated by experiment how it was that straws, twigs, and other small articles floating upon the water collected into clusters. Some of the least complicated methods of measuring surface tension were briefly referred to and illustrated, after which the lecturer concluded with an experiment which showed that owing to some occult cause the presence of electricity altered the size of the drops composing a jet of water.

A vote of thanks to the lecturer was proposed by Professor EVERETT, who paid a high compliment to Mr. Barcroft for the manner in which he had dealt with a difficult and intricate subject.

Mr. JOHN BROWN seconded, and the motion was passed by acclamation.

The proceedings then terminated.

February 4th, 1895.

Lavens M. Ewart, Esq., J.P., occupied the chair.

Mr. S. F. Milligan, M.R.I.A., vice-president R.S.A., Ireland, delivered a Lecture on

"ANTIQUITIES, SOCIAL CUSTOMS, AND FOLK LORE OF TORY, INNISMURRAY, AND THE SOUTH ISLANDS OF ARAN."

Mr. Milligan said—Mr. President, ladies, and gentlemen, as you are aware there was an excursion organised last summer by the Royal Society of Antiquaries to start from Belfast by a steamer calling at Tory Island, Innismurray off the coast of Sligo, High Island off the coast of Mayo, and finally the three islands of Aran lying across the entrance of Galway Bay. These islands could only be visited by a sea-going steamer, and the object of the visit was not an ordinary holiday cruise, but to examine the ancient Pagan and very early Christian Churches in these remote isles, and finally reach the city of Galway, where the summer meeting of the Society was to be held. The whole affair was most successful and greatly enjoyed by the members, who were fortunate enough to be of the party. To enable you to understand the origin and objects for which the ancient churches, altars, and other structures were erected on these islands, you will require to take a long look backwards to the time Christianity was introduced into Ireland. You have heard of the Island Monasteries of the ancient Celtic Church of Ireland ; if you have not, you will find in the pages of our journal, third quarter, 1891, a very interesting and instructive

paper by the Rev. Dr. Stokes, and in his work "Ireland and the Celtic Church" you will find a further account of the origin of monasticism in Ireland. About the middle of the third, and the commencement of the fourth century, the Roman Emperors sorely persecuted the Christian Church over the entire of their dominions. Great numbers of Christians in consequence of this, in Syria and Egypt particularly, left their homes and retired to desert places to dwell. From this cause monasticism originated. They lived in the deserts at first singly as anchorites, who were the original monks, and at a later period in communities under the rule of an abbot. St. Anthony is looked upon as the founder of monasticism in Egypt, where he lived in the desert to a very old age—I think some 90 years. This example was copied in Ireland, and anchorite monks retired to a place called a desert, where they lived a very ascetic life. Place names commencing with desert, such as Desertmartin and Desertcreat, derived the name from monks who had retired to these places. Many in Egypt followed in St. Anthony's footsteps, so that before his death he had thousands of followers. In those times there was considerable commercial intercourse between Alexandria and various Mediterranean ports, as far as Gaul. Marseilles then as now was a great commercial port, and along these trade routes the monks followed in the course of time just as our missionaries follow in the track of English commerce. They founded communities along the islands, avoiding the mainland, and the great cities until they reached Gaul, from which they eventually came to Ireland. The islands around the West Coast of Ireland suited their purpose admirably, and in all the principal islands from the Skelligs to the Copelands they founded monasteries, the ruins of which after the lapse of 1,300 years we had on this excursion come to inspect. On Innismurray there still exists in a wonderfully perfect state one of these primitive monasteries, another on the Skellig Rocks, off the Coast of Kerry. The history of the ancient Irish Church clearly shows it was derived from the Eastern not the Western Church. The architecture is of an Egyptian type known as

the entablature style. The little primitive churches we visited in Innismurray and Aran, with square-headed door-ways, and inclining jambs, are Egyptian in their character. The stone bee-hive huts are also of Eastern origin, similar structures having been in common use in Syria at the same period. After the islands around the coast were occupied, the islands of the larger lakes of Lough Erne, Lough Ree, Lough Derg, in the Shannon, and others were also occupied by these ancient order of monks. The remains of their monasteries and anchorite cells still remain as the most incontestable proofs of their existence. The first churches were frequently erected within a rath or cashel. The reason is obvious. At a time the country was semi-Pagan, it was necessary to have protection, where life and property were so insecure. The islands were chosen for the security they afforded, as well as to be removed as far as possible from the external world. The Celtic monasteries had another important function to fill—they were the great schools of the period. Bangor, County Down, had a celebrated school, where Columbanus, the great apostle of Northern Italy, was educated. On the mainland, where there was a good depth of soil and timber was plentiful, the enclosure was an earthen rampart, and the church probably timber and thatched. On the islands the same conditions did not exist, there was no timber, and very little soil, but plenty of stone ; hence the churches were built and roofed with stone, not a particle of timber being used, and the enclosure was a cashel or stone wall built without mortar and very broad. Views of the small churches in the cashel at Innismurray, the stone bee-hive huts, the altars, crosses, the holy wells, bath or sweating house were all shown. The bee-hive huts, primitive church, incised crosses, and holy well on High Island were shown. A series of views of the churches, forts, and bee-hive huts were shown belonging to the three Islands of Aran, as well as numerous views of the island and the people. The lecturer then proceeded as follows—Leaving the antiquities of these islands to take a view of the social condition of the people, they present to us a most interesting

study, with their old-world customs and modes of thought so different from that of the 19th century elsewhere. Just now they have commenced a transition stage; the steamboat and the tourist are invading their retreats. Emigration to America, and particularly the return of emigrants to visit their native islands, all these combine to produce a change in the habits and customs of the people, so that it may be expected further changes will take place, and those interesting customs will disappear. At present they fish in coracles similar to those used by the ancient Britons made of a wooden frame work, the only difference being that tarred canvas is now used for covering instead of cow hides. They do not wear boots and shoes as we do, but a sandal they call pampoodies, made of cow hide, with the hair outside and tied across their instep by a thong. They make all their own textiles, they spin the wool of their sheep, weave and dye it suitable for the garments of either sex. Mr. Milligan exhibited specimens of cloth, which is most durable and well suited to its purpose. The men wear loose trousers to the ankle, a vest, and sleeved homespun tweed jacket, and for a head-dress a Tam o' Shanter cap, knitted by the women on the island. The women wear homespun, their petticoats usually dyed red. The material is pure wool, and most enduring. They all wear pampoodies, and can walk over the rocks and stony ground of their Islands with a firm, elastic tread; even the old men walk out with a springy, youthful step. The Irish language is spoken invariably amongst themselves, but a great many talk English to visitors. The largest island, Innishmore, is nine miles long and about 1½ miles broad. The population at the last census was 1,996. Innishmaan, or the Middle Island, is separated from Innishmore by a channel 2½ miles broad. It is 2½ miles long, and had a population of 456 in 1891. Innisheer, the South Island is two miles long, and had a population of 455. It is separated by a channel four miles broad from Innishmaan, called the Foul Sound. The total population is about 3,000, and the rental £2,085 10s 6d. The landlord is Mr. John W. Digby, of Landenstown, County Kildare. The people live

partly by farming and partly by fishing; the latter has great room for development, as they fish only in their canoes, which are not equal to Norway yawls for deep sea fishing. It is very probable the Congested Districts' Board will, in the near future, assist the islanders to develop the fishing as they have done in other places around the coast. Up to the reign of Queen Elizabeth the islands were owned by the Teige O'Brien, branch of the O'Briens of Clare, descendants of Brian Boru. They passed to various owners afterwards, being mortgaged and sold, until they came to the present owners. O'Brien's Castle still stands on the highest part of Innisheer, in sight of the County Clare, the native county of the O'Briens. Oliver Cromwell, in the time of the civil wars, took the Islands, built a strong castle at Killeany, on the North Island, which is still standing. He left a garrison in this island, many of whom never left it, but intermarried with the natives. The houses on the island are very clean. Women attend to domestic duties, spin wool, knit, gather carrigreen moss, weed their crops, and do other light work. The air on the island is very pure, and there is scarcely any disease; consumption and rheumatism are very rare. The people frequently live to a great age. On a stone in the churchyard at Killeany is the following inscription :—"Michael Dirrane, who departed this life in the 119th year of his age. Dated, 1817." Several wonderful stories are told of a greater age than this. When the Land Bill became law the tenants took advantage of it to get fair rents fixed. The result was a reduction of about 40 per cent. on the average rentals. Their mode of salutation is worthy of note; the visitor, on entering a house, says, "God save all here." Meet a man on the road, greet him with a "God save you, sir," he'll remove his hat and reply, "God save you kindly, your honour." If you pass them working in a field always address them with a "God bless your work, boys," they will answer, "And you, too, sir." They are an extremely virtuous race, cases of illegitimacy being almost unknown. There is neither a jail nor workhouse on the islands. One of

the magistrates of the old times used to summon his Court for the first fine day, and hold it sitting at a table in the open air. If there was a serious case that his Worship thought should be punished, he would draw out a committal warrant, hand it to the defendant, who, without the intervention of police, or anyone else, would take the warrant, travel to Galway and deliver himself up, warrant in hand, at the county jail. Stokes, in his life of Dr. Petrie, says, "If the inhabitants of the Aran Islands could be considered as a fair specimen of the ancient and present wild Irish, the veriest savages of the globe, as the learned Pinkerton calls them, those whom chance had led to their hospitable shores to admire their simple virtues, would be likely to regret that the blessings of civilisation had ever been extended to this very wretched country." Mr. Milligan next read several letters he received from a very intelligent native of Innishmaan, whose acquaintance he made during his visit. These letters are in reply to a series of questions Mr. Milligan had asked, and are given verbatim as received:—"I beg to acknowledge the receipt of your two letters and the books. The delay in writing sooner is owing to the fact that there is no post office in Innishmaan, and no nearer than Kilronan, in the North Island, and the weather being so bad during the Christmas week that no canoe could leave our island. Your last letter was four days in Galway before reaching North Aran. With regard to the questions asked in your letter—first courtship and marriage. In many instances the young couples do have an eye on one another previous to the match-making, but there is hardly any such thing as private meetings ever takes place between them. They will meet on the road and only exchange a few words, and the young man will often drop into the parents' house of an evening for a chat. But in a great many instances a marriage is brought round in this way. The young woman is in her father's kitchen, may be getting dinner ready, when in walks two or three neighbours—elderly men in all cases. Intuitively the object of the visit is known, particularly if it happens between Christmas and Ash

Wednesday. The object is soon made known. I should have stated the girl's parents are not quite taken by surprise, for word is sent two days before that such an event may be looked for. Then the terms of the marriage are talked over, over, may be, a drop of drink. When all is nearly settled the girl is called in and asked by the intended husband's friends if she is willing. She is asked then to taste whatever they may be drinking, and the bargain is made. The marriage invariably takes place the following morning; always provided there is no close kinship between them, when the Archbishop's (Tuam) consent must be obtained. The marriage fees are increased by a pound or more in such cases. The girl may or may not go to the husband's house that night, but if she does not go that night, she does not go for a month. Second, there is always a bonfire on the islands on St. John's Eve, however scarce the fuel may be, mostly one in each village. Third, games on a winter night. One is popular. A number—say ten—youngsters assemble; they divide into groups of five. Lots are drawn to see who gets in the centre of a circle. The person on whom the lot falls stoops down. The nine stoop down in the same manner. 'A soongawn,' or thick straw rope, is then passed quickly from one to the other, under their legs, whilst sitting close together, so that the person in the middle cannot see who has the rope. From some unexpected hand he gets a blow, anywhere except on the face, which often pretty well hurts him. Outdoor games are chiefly ball-playing. Fourth, wakes and funerals. There is always a supply of pipes and tobacco and drink. Even when a near friend dies in America the person is very often waked in the parents' house (just as if the body was present) for one night only. The people keen at funerals always, both at the corpse's house and at the grave. There is no particular door for bringing out a corpse, but the south door is most usual in our island. The persons who carry the coffin from the coffin-maker's house to the residence of the deceased are the persons who invariably lower the coffin into the grave. Ghost and Fairies—The Banshee is not understood

here ; never heard about her. The belief in ghosts and fairies is vague, not a firm belief ; but there are many who would not on any account go out alone at night, whilst others will go out in the darkest night anywhere. The devotion at holy wells is still very great, and it was quite a common thing for people to remain at a holy well all night during the summer season in prayer ; but certainly this practice is getting less and less. As regards May Day, it is an old habit not to change cattle from one field to another on that day. Steamer coming in, and I must now conclude in haste; more next letter. There is no poteen made in the Aran Islands, but it was made in Innishmann until about eight years ago, when it ceased. There is a custom of midwives. After the birth of a child, if the labour has been painful and the woman much exhausted, nine articles of the husband's clothing are brought and dropped over her as she lies, one by one, saying three times, 'Father, Son, and Holy Ghost.' Wooden drinking vessels, or methers, of one piece, have quite disappeared. I remember one in my father's house when I was growing up. In reply to the question, Are the people musical ? It is a fact that there are no professional musicians on any of the islands, nor have been in my recollection. We have always a visit from a piper or a fiddler on pattern days. He comes sometimes from the County Clare, and sometimes from Galway. But there are plenty of people who can sing well and whistle. Some of the best whistlers one could hear are to be found on the islands. The young people are beginning to get melodeons, and are learning to play them. There is occasionally a dance in the winter evenings, with the melodeon playing. Some fishermen are in the habit of always bringing with them a very small bottle of water from one of the holy wells when going to fish. They keep it in the canoe under the gunwale. A habit that used to prevail in some families, but the practice was not quite general, and is disappearing, was for a person intending to go to America to remain up all night, if in summer, in prayer beside one of the holy wells, the night before leaving home. American thought and feeling, however,

has done a good deal towards effacing the practice, for there is a regular stream of people going to and returning from America. It is quite a common thing for a person who has spent a few years in America to come home for a few months and go away again. Some gentlemen come to this island and stay for three or four weeks. There was a German gentleman, Dr. Fincke, stayed for six months, and there is now a Dr. Petersen, a Dane. Both these stayed in Kilronan. When taking your holidays next year, you might spend a few days here."

Mr. Alexander Tate, C.E., in proposing a vote of thanks to the lecturer, said he had very great pleasure in doing so, as he happened to be one of those who had visited the islands on the occasion which formed the subject matter of Mr. Milligan's lecture. For that reason he could testify to the faithful way in which the representations had been given, and he thought that the description of the enjoyable trip which he had given them that night would enable those who had not had the privilege to join in the expedition to form a very accurate idea of its pleasurable nature. Mr. Tate then referred to the valuable impetus which had been given to the movement for the better recognition of the Irish West Coast as a pleasant summer resort by the British Association, and said that many persons paying a too hasty visit to these islands returned home, bringing with them ideas about the character and habits of the population which had no possible foundation. Therefore, gentlemen like Mr. Milligan, who visited these interesting spots, possessing, as he did, a keen intelligence, and making a careful investigation of the customs of the people of the district, gave valuable help indeed, and assisted to counteract many groundless statements. Professor Hodden and others, he thought, had come to hasty conclusions.

Mr. John Workman, J.P., seconded. He said he had listened with the greatest pleasure to Mr. Milligan's remarks. The description which he had given them, and the pictures which illustrated his remarks, gave them an admirable idea of

the wonderful character and manner of the inhabitants of these islands.

The resolution was passed by acclamation.

Mr. Milligan, in acknowledging the vote, referred to the intention of the society to visit the Galway coast on their next cruise.

The proceedings then concluded.

4th March, 1896.

Robert Lloyd Patterson, Esq., J.P., M.R.I.A., President, in the Chair.

Mr. Conway Scott, C.E., gave a Lecture on

"THE PRODUCTION OF ABILITY."

Mr. Scott introduced his subject with the remark that many historians and students of history had asked the pregnant question, why it was that at certain stages of the world's history certain men had appeared whose lives and actions had changed and moulded the age in which they lived and influenced subsequent ages and peoples. A man called Alexander the Great, after about twelve years of incessant labour, died at the early age of thirty-two, and, as if by magic, the whole face of the world was changed. The old chapter of the world's history was closed, and a new and very different one commenced, and the lives and conditions of many generations of men were very different because that single man once lived and laboured in this world. A man called Julius Cæsar was born in Rome. He fought and conquered all over the earth, and at the age of fifty-six he died by the assassin's dagger. But his work was done. Many millions of humanity would have lived very different lives from what they had done if that great Roman had not once lived and acted as he had done. Napoleon I. was born in semi-civilised Corsica, and although he died a lonely exile in St. Helena his work was done. The old chapter of feudalism closed for ever, and for good or for evil the reign and triumph of democracy commenced. It was the same within the sphere of religion. The lecturer instanced the cases of

Martin Luther, to whose life and labours they owed Protestantism, civil and religious liberty, and modern civilisation to some extent; and John Knox, from whom Scotch Presbyterianism and Scotch education had sprung, and many generations of Scotchmen had had their lives greatly altered by the fact that that man lived. Having referred to Homer and Plato, Mr. Scott proceeded to emphasise the results, so far as the history of humanity is concerned, which have been derived from the lives and actions of the great men who had lived and worked in this world. The next question considered was what produced those great men, why they appeared at particular times, and why it was that there were long stretches of time in which such men did not appear? Every man and woman had several things in common, and the basis of the child's character and intellect was derived from his parents and from no other source. The necessary qualities were energy, courage, force of character, industry, perseverance, and capability. Those qualities were distinctly hereditary. No man could attain any eminence or success in this life without those qualities developed in a greater or less degree. He called these qualities the practical qualities of life, and many men possessed of high intellect, imagination, and deep feeling had become hopeless wrecks in this world from the want of those great qualities. Intellect was that godlike power which raised men above the mere animal creation. Intellectual power was derived from the individual's parents. No education, training, or surroundings could change a man born with feeble intellect to the level of the man born with a large amount of intellect. The great power was imagination, and this great power was also strictly hereditary. Parents of little imagination would have children of little imagination, and *vice versa*. Imgination was the great creative power in man. Shakspere's creative imagination saw before his mind's eye the great figures in history, and his intellect and literary skill gave them true form. Thousands of men before James Watt saw steam issuing from a kettle, but his great imagination pictured the problem in very many forms,

and the result was the first steam engine. Millions of men before Newton saw apples fall from the tree to the ground, but his imagination took it up, his great intellect worked out the problem, and the result was his discovery of the law of gravitation. Imagination in its proper place was the greatest blessing to humanity, but misplaced it became a curse. Tremendous injury was the result of work done by imagination, which ought properly to be performed by intellect, education, and experience. How were great men produced? The answer was very simple—by well-assorted marriages. The old Jewish Rabbi was right when he said—"Give me the arrangement of the marriages, and I will change and ennoble the whole human life." The lecturer illustrated his argument by quoting the cases of great men who were celebrated in arms, literature, and politics, and showed that an examination of the characters of the parents of those men proved that ability, greatness, and even genius were the result of the union on the one side of intellect, imagination, and feeling with strong energy and force of character on the other. Nearly all the qualities that had made England a great nation were derived from the old Scandinavian pirates, and the blending of the celtic and English races invariably resulted in the production of distinguished ability. In a country where marriage was a mere barter for wealth, station, and titles such a country would soon cease to produce a large crop of ability.

Dr. SHELDON thought that the members of the Society might congratulate themselves on the fact that the essayist was one of their number. He might remark that, while he considered the basis of the lecture correct, the lecturer had driven the theory to the far end, and he thought they might set to work and have a companion paper on those great men who did not owe their greatness to their parents, and endeavour to ascertain if the converse of the picture would hold good. They owed a debt of gratitude to Mr. Scott for his admirable and interesting essay.

Professor Fitzgerald joined with the previous speaker in thanking Mr. Scott for his valuable address.

Mr. F. W. Lockwood and Mr. Wm. Gray, M.R.I.A., having made some observations on the lecture,

The President conveyed the thanks of the meeting to Mr. Scott, who briefly replied, and

The meeting concluded.

16th April, 1895.

The Lord Mayor in the Chair.

Mr. John Brown gave a Lecture on
"AUTOMOBILES OR HORSELESS CARRIAGES."

Mr. Brown has for some time past given considerable attention to the subject of motor carriages, and during a recent visit to France purchased one, which is believed to be the first introduced into this country. It is driven by a Serpollet steam motor, and was last night on exhibition at the hall, where it was inspected with much interest by a large and representative audience, which included many leading local scientists. In addition to the carriage itself, Mr. Brown employed to illustrate his lecture a numerous collection of excellent lantern slides showing the history and development of this application of mechanical ingenuity.

The Lord Mayor, who was cordially received, said he had always taken a very deep interest in all kinds of mechanical progress, and it was a matter for extreme regret that while great developments had taken place during recent years in mechanical contrivances for a variety of purposes, in one particular—namely, that of horseless carriages—British skill and enterprise has not only been discouraged, but positively checked and thwarted by an antiquated Act of Parliament that should have been repealed long ago. He had alluded to this subject at the Council meeting on the first of the year, when he was installed into office as Lord Mayor, expressing the hope that before the century was out they would see horseless carriages going through the streets of Belfast as well as in other cities of the United Kingdom, and he at the same time drew

the attention of the local M.P.'s to the importance of the matter, and urged them to take to themselves the credit of getting a Bill passed through the House of Commons legalising this mode of conveyance. This was not a question merely of amusement and recreation, but also one of utility and economy. In fact, automobiles were required chiefly for business purposes, and therefore the restriction on their use in this country placed its inhabitants at a great disadvantage, and at the same time entailed considerable loss. There was, however, a far more serious aspect of the question, and that was the effect upon British industry to which he had already referred. The design and manufacture of these carriages in their own country should have received every encouragement, whereas the very opposite had been the case, and the result of course was that an enormous industry has been built up on the Continent—a proof of which Mr. Brown had given them by the excellent specimen which, he understood, he had imported from France. Even when they got permission from their tardy legislators to use automobiles it would, he feared, take a very long time to make up for the ground they had lost and successfully compete with their Continental friends, who had already attained great perfection with their carriages, and who no doubt would have a tremendous stock ready to pour into the English market. The subject of the lecture was so interesting to him that he feared if he began to go into details he should require Mr. Brown to remain seated while he gave the lecture himself, so he had better ask Mr. Brown to proceed at once, and no doubt he would say a good deal both to interest and instruct them.

Mr. Brown then proceeded with his lecture, which was listened to throughout with deep interest and was frequently applauded. In introducing his subject, Mr. Brown drew attention to the importance of rapid, convenient, easy, and cheap means of transit as having been recognised by the most important peoples of all ages. The greatest modern nation, our own, had produced, for instance, the steamship, the locomotive, the macadamised road, and the finest breed of horses as motors

for the road traffic. That Britain was not a pioneer in the employment of the mechanically-propelled road carriage was due not to any want of ingenuity in her sons, but solely to popular opposition and prohibitive legislation in favour of the horse, regarded as he is with so much sentimental tenderness, and, as it were, hereditary gratitude, for his great services of many kinds. Hence the mechanically-propelled road carriage, which approached practical completion sixty years ago, has not yet been allowed to perform the good services which other nations have now shown to be possible. While the horse would now to a certain extent be superseded, it would be chiefly in his more menial duties that he would be relieved. The tram horse, 'bus horse, and cab horse would disappear. The hunter, the race horse, the cavalary charger, and, to a considerable extent, the carriage horse would remain, an ennobled race of noble animals at present often ignobly used. Among the numerous names suggested for the new form of vehicle the lecturer preferred the French term automobile as more etymologically correct than "horseless carriage," "non-equine," "motor-car," &c. For valuable information on the historical part of his subject the lecturer was indebted to the Cantor lectures of Mr. Worley Beaumont, who sent also a fine set of lantern slides. For other sets he had to thank also Sir David Solomons, Bart, of Tunbridge wells; Mr. Shrapnell Smith, of Liverpool; and Mr. J. H. Knight, of Farnham, the inventor of a successful motor tricycle. Mr. T. F. Shillington had also given a valuable suggestion for heating the steam generator of the carriage exhibited, and had kindly lent the apparatus for carrying it out. It was pointed out that the desire for automobiles dated from early times as shown by the great appreciation of the enchanted horse or the seven-leagued boots of the fairy tales. In Chaucer's "Canterbury Tales" we hear of a "steed of brass," the presentation of which made "ful glad and blithe this noble doughty kynge." It was not, however, till 1769 that the first practicable automobile was invented by Cugnot, a native of Lorraine. It was a steam tricycle, and ran about Paris at a

speed of three or four miles an hour—a speed which would not seem excessive at all events to our modern police. The machine is preserved in the Musée des Arts et Metiers. Fifteen years later William Murdock made a model steam carriage. It is related that when trying it in a churchyard at night it greatly frightened the vicar, who met it accidentally on its fiery way, and at once concluded it to be of the evil one. In 1802 Trevestried constructed a steam carriage that attained a speed of ten miles an hour. A little latter Gurney constructed passenger coaches, which plied between Gloucester and Cheltenham, and covered some 4,000 miles before they were stopped by public opposition and the extravagantly high tolls charged at the turnpikes for them. Views of numerous other early coaches were shown, including one called the Fly-by-night. After having been summoned for too high speed several times, its owners rigged it up to look like a fire engine, donned brass helmets, and thus contrived to escape legal interference for some months. The great weight of the machinery in nearly all these early forms was prohibitive. This difficulty is now surmounted by using the oil motor, recently so generally applied. The first automobile propelled by an oil engine was brought out by an Englishman, Mr. E. Butler, in 1883. Many of its details were similar to those now employed in the Continental forms, but Mr. Butler, like all other Englishmen, was obliged to give up making automobiles because of the illegality of using them in England. In considering the history of English effort in this direction, one cannot help being struck by the undaunted enthusiasm which induced men time after time to spend so much thought and money, sometimes to the complete emptying of their pockets, notwithstanding the complete discouragement with which the law oppressed them. One can only imagine what might have been if the law had been encouraging instead of the reverse. As the automobile is on account of this discouragement not a British product, it was necessary to study it elsewhere, and for that purpose the lecturer had made a trip last autumn to Paris, calling on the

way at St. Omer to visit a French gentleman, M. Doazan, well known in the world of automobiles in France. M. Doazan, in the most hospitable and kind way, gave most valuable help in Mr. Brown's investigations. A graphic description was given of a ride on a Serpollet carriage, then owned by M. Doazan, afterwards purchased by the lecturer and now exhibited in the hall. The driving gear of this carriage was explained as resembling that of an ordinary tricycle, if we substitute for the pedals a little steam engine placed under the seat. This is supplied with steam from a Serpollet's instantaneous steam generator at the back of the carriage. This generator is virtually a series of steel tubes heated by a coke fire to a considerable temperature. When the engine is to start a little water is pumped into these coils by hand, and is instantaneously converted into steam, which passes at once to the engine and starts it. A feed pump, worked by the engine, then keeps up the supply of water to the generator, unless it is desired to decrease the power or slow down, when a valve under the control of the driver allows the water to escape by a by-pass back to the tank. This gave great ease of control of speed and power, the want of which to the same extent is a defect in other forms of automobile. The exhaust steam is used to create a draught as in ordinary locomotives. When running, however, no steam or smoke was visible, and there was very little noise. The steering was managed by the front wheels, each wheel working independently, and arranged so as to steer with the least possible drag or friction. The brake was necessarily a very powerful one. It consisted of a band of wire rope, making two turns round a drum on the driving-wheel on each side. One end of the wire rope was attached to a foot lever, the other to a lever acting on an ordinary brake on the rim of the wheel, which it pulled on as well when the foot lever was depressed. The brake is thus really of a quadruple nature, and can bring the carriage to a stand almost at once. The lecturer then described a drive in a phaeton belonging to a friend of M. Doazan, which was propelled by a Daimler

petroleum motor. The speed was not so easily controlled as in the Serpollet, and not so great over the rather heavy roads tried, being only eight or nine miles an hour. It was explained that, though this might be considered satisfactory in a horse, one expected more from a mechanically-propelled vehicle. One sees perhaps that the horse is struggling painfully and one pities him, and prefers a modest six miles per hour to inflicting pain. There are no such feelings towards steel and steam or oil power. Ten to fifteen miles an hour should be attainable, and more is perhaps neither desirable nor necessary. For this a five-horse-power engine is believed to be required for a carriage for four people, although one old-fashioned horse is all that we frequently allow for the same task. The explanation of the apparent anomaly appeared to be that we do not expect so much from the horse, and also that the horse is able at a pinch and for a short time to exert much more than one theoretical horse-power, although the average of his whole journey would not be more than one. We class engines, however, not by their average, but by their maximum horse-power, and this maximum power might be required only once or twice on the journey. The oil motor was referred to at considerable length, and described as an offspring of the gas engine, in which a combustible mixture of air and oil vapour is set on fire in the cylinder of the engine, giving thereby an increased pressure on the piston to be transmitted in the usual way to the working parts of the engine. The advantages of the oil engine for automobiles are—1. Its readiness to start at any time on the shortest notice. Our professional coachman will feel insulted if required to turn out a carriage and pair in less than thirty or forty minutes, while the automobile may be started in two or three. This is obviously very advantageous for doctors, firemen, and others who require to lose no time at any call night or day. 2. The small weight and bulk of the oil motor, say from 70 to 100 lb. per horse-power. The room occupied by the horse both in the stable and on the street is thus saved, and this

latter is of no small importance in crowded thoroughfares. 3. It does not tire. 4. Its power for speed is quite double that of the horse. 5. It does not eat, and requires no attention unless while working, and when it is working costs about half as much as live horse-power. The engine chiefly used for carriages is the Daimler, a two-cylinder vertical engine, working on the Otto cycle and using benzoline. It runs at about 700 revolutions per minute. The speed of the carriage is reduced and varied at will by gearing under the control of the driver. In the great race from Paris to Bordeaux and back, in which forty-six carriages entered for prizes value £2,680, the first four carriages to arrive were propelled by Daimler engines, much to the chagrin of the French, who had hoped much from their native steam and electric carriages, the Daimler being of German origin. The fastest of the four was a carriage for two persons, and covered the 744 miles in 48h. 47m., or at the rate of over 15¼ miles per hour for the whole journey. Among the others several were propelled by steam and one by electricity. This last, however, met with an accident and did not complete the course. It is sometimes popularly supposed that electricity should be the power *par excellence* for such carriages. It is forgotten, however, that, firstly, the electric motor is of itself a heavy machine; and, secondly, one cannot buy electricity by the pint at the wayside shops as one can buy petroleum oil. One must carry all one wants, and the means of doing so, the electric accumulators, are also extremely heavy. The accumulator for the carriage referred to, which was built by Jeantaud, of Paris, weighed 17½ cwt., the 7-h.p. motor 4½ cwt., and the whole carriage 3 tons 3 cwt. The speed was 7 to 15 miles per hour, according to the quality of the road. Numerous limelight views were shown, including carriages of all kinds from a Pennington bicycle, said to run a mile in one minute, to an immense coach with over a dozen passengers. Mr. Brown's own carriage, which arrived from St. Omer on the 6th March last, and is believed to be the first automobile imported into this country, was shown with its engine running, so as to

illustrate its working. In concluding his remarks the lecturer pointed out that the tendency for people to crowd into towns would be relieved by the cheaper means of transit that would allow them easy access to town while living in the country; that the advent of cheap power in small portions might lead to the re-establishment of some "cottage industries," which had been concentrated into factories, because power can only be had cheaply in large engines. The application of motors to waggons will enable producers of all kinds to send products to markets cheaply and quickly. Each man may thus have his own light railway wherever there is an ordinary road. The benefit to our fisheries and to farmers at distant points is obvious. Oil motors would no doubt also be applied to agricultural machinery, to navigation, and would make aëriel navigation possible, if not probable. For tramway purposes there were great possibilities, and the lecturer ventured to say that our own city was possibly somewhat behind the times in adopting a system which, although admittedly preferable to horse traction, might, in the rapid march of invention to-day, almost be called antiquated already. The attention of so many engineers was now directed to small and powerful motors that one need not be surprised to see in a year or two motors that could be put into our present cars with very little alteration of the car, with no alteration of the track, with no encumbrance on the street, with no extensive outlay on a central power station and electric conductors, and with the assurance that we could feel our way by trying one car at a time, and if unsuitable abandon or alter it without incurring any important outlay of capital to begin with.

At the close of the lecture,

Mr. George Andrews moved the following resolution :—"That this meeting approve of the proposed modification of the Locomotive Acts so as to promote the use of mechanically propelled carriages on public roads, subject to suitable provisions for the safety and convenience of the public." Such an amendment of the Acts as the resolution approved was, he

considered, necessary. Though all sorts of motors might not be an unmixed benefit to the public, yet he felt, and he thought it was the feeling of the meeting also, that if these machines could be used safely in other countries they could be used with equal safety in this, and though they might be unsuitable for crowded towns there could not be any reasonable objection to their use under proper provisions in the country districts.

Professor EVERETT seconded the motion. He believed he was right in saying that a measure for the amendment of the Acts on the lines of the resolution was at present in the way of being passed in the Lords, and he hoped it would pass the Commons also, as he believed these carriages had a great future before them.

The resolution was passed unanimously.

President HAMILTON, in proposing a vote of thanks to the lecturer, said Mr. Brown was one of that class of Belfast men who found time after the business of the day to take up some branch of science or literature—a class of men which in old times gave to Belfast the name of the Athens of the North, and a class which he was glad to say was still very largely represented in the city. None could have helped being struck by the lucid, comprehensive, and concise manner in which Mr. Brown had dealt with his subject. He believed it would be only a matter of time before the law would be altered so as to remove these restrictions, and he felt sure the local members of Parliament when they heard of that meeting would give a helping hand to the movement, so as the English manufacturers might not be longer placed at a disadvantage. He trusted, too, that the Lord Mayor in his years of office—for he thought they did not intend to let him go after one year—would have the gratification of inaugurating a system of horseless carriages in the city.

Mr. A. HAMILL seconded the motion, which was passed with acclamation, and briefly acknowledged by Mr. Brown, who took the opportunity of expressing his acknowledgements to, in addition to the gentlemen already named, Mr. T. F.

Shillington for his valuable suggestion with regard to heating the furnace with gas in order to show the motor carriage working, and also for the apparatus to carry it out ; Messrs. H. & J. Martin for the staging on which the carriage was raised, and the Edison-Swan Electric Company for supplying an electric fan.

Mr. PATTERSON, amidst applause, conveyed the thanks of the audience to the Lord Mayor for presiding.

BELFAST

Natural History & Philosophical Society.

Officers and Council of Management for 1896-97.

President:

PROFESSOR J. D. EVERETT, F.R.S., D.C.L., &c.

Vice-Presidents:

JOHN BROWN, Esq.
THOMAS WORKMAN, Esq., J.P.
J. A. LINDSAY, Esq., M.D., M.A.
WM. SWANSTON, Esq., F.G.S.

Hon. Treasurer:

JOHN BROWN, Esq.

Hon. Assist. Treasurer:

W. H. F. PATTERSON, Esq.

Hon. Librarian:

THOMAS WORKMAN, Esq., J.P.

Hon. Secretary:

ROBERT M. YOUNG, Esq., B.A., J.P., M.R.I.A.

Council:

JOHN BROWN, Esq.
PROFESSOR J. D. EVERETT, F.R.S., D.C.L.
LAVENS M. EWART, Esq., J.P., M.R.I.A.
PROFESSOR M. F. FITZGERALD, B.A., M.I.M.E.
JOHN H. GREENHILL, Esq., Mus.Bac.
JOHN HORNER, Esq.
JAMES A. LINDSAY, Esq., M.D., M.R.C.P.Lond.
R. LLOYD PATTERSON, Esq., J.P., F.L.S.
WM. H. PATTERSON, Esq., M.R.I.A.
THOMAS F. SHILLINGTON, Esq.
WM. SWANSTON, Esq., F.G.S.
THOMAS WORKMAN, Esq., J.P.
JOSEPH WRIGHT, Esq., F.G.S.
ROBERT YOUNG, Esq., J.P., C.E.
R. M. YOUNG, Esq., B.A., J.P., M.R.I.A

SHAREHOLDERS.

[* *Denotes holders of three or more Shares.*]

*Alexander, Francis, B.E.,	Belfast.
Allworthy, Edward, Mosaphir,	do.
Anderson, John, J.P., F.G.S., East Hillbrook,	Holywood.
Andrew, John, J., L.D.S., R.C.S., Eng. Belgravia,	Belfast.
Andrews, Miss Elizabeth, College Gardens,	do.
Andrews, George, J.P., Ardoyne,	do.
Andrews, Samuel, J.P.,	London.
Armstrong, Thomas, jun., Donegall Square West,	Belfast.
Barbour, James, J.P., Ardville, Marino,	Holywood.
Beattie, Rev. A. Hamilton,	Portglenone.
Bigger, Francis J., Ardrie, Antrim Road,	Belfast.
Bland, Robert H., J.P.,	Lisburn.
Bottomley, Henry H., Cultra,	Holywood
Boyd, William, Blackstaff Mill,	Belfast.
Boyd, William Sinclair, Ravenscroft, Bloomfield.	do.
Braddell, Edward, The Limes, Malone Park,	do.
Brett, Charles H., Gretten Villa South, Malone Road,	do.
Brett, John H., C.E., Fortwilliam Park,	do.
Bristow, James R., Lismore, Windsor Avenue,	do.
Brown, John, Longhurst,	Dunmurry.
Brown, William K. (Representatives of),	Belfast.
Bulloch, Alexander, Eversleigh, Malone Road,	do.
Burden, Henry, M.D., M.R.I.A. (Representatives of),	do.
Burnett, John R., Rostellan, Malone Road,	do.
Byers, Prof. John W., M.A., M.D., University Road,	do.
Calwell, Alex. M'D.,	do.
Calwell, William, M.A., M.D., College Square North,	do.
*Campbell, Miss Anna (Representatives of),	do.

Campbell, John, College Gardens (Reps. of),	Belfast.
Carlisle, A. M., Elmwood House,	do.
Carr, A. H. R., Rathowen, Windsor Avenue,	do.
Carson, John, Walmer Terrace,	Holywood.
*Charley, Phineas H., Mornington Park,	Bangor.
Clarke, George H., J.P., Roseville,	Lisburn.
Clark, George S., Dunlambert,	Belfast.
Coates, Victor, J.P., D.L., Rathmore,	Dunmurry.
Connor, Charles C., M.A., J.P., Queen's Elms,	Belfast.
Cowan, P. C., M.I.C.E., College Gardens,	do.
Crawford, William, Mount Randal,	do.
Crawford, William, Calendar Street,	do.
Cuming, Professor James, M.A., M.D., Wellington Place,	do.
Cunningham, Professor Robert O., M.D., F.L.S., F.G.S., Montpellier, Malone Road,	do.
Davies, John H., Glenmore Cottage,	Lisburn.
*Deramore, Lord, D.L. (Representatives of),	Newtownbreda.
Dods, Robert, B.A., Dunluce Terrace,	Belfast.
*Donegall, Marquis of,	do.
*Downshire, Marquis of, The Castle,	Hillsborough.
Drennan, W. H., Fountain Street,	Belfast.
Dudley, Rev. Freeman, B.A., The Rectory,	Kilkeel.
Duffin, Adam, LL.D., University Square,	Belfast.
Dunleath, Lord, Ballywalter Park (Reps. of),	Ballywalter.
Everett, Professor Joseph D., M.A., D.C.L., F.R.S., Derryvolgie Avenue,	Belfast.
Ewart, G. Herbert, Firmount, Antrim Road,	do.
Ewart, Lavens M., J.P., M.R.I.A., Glenbank House,	do.
Ewart, Sir Wm. Quartus, Bart., J.P., Glenmachan House,	do.
Fagan, John, F.R.C.S.I., J.P., Great Victoria Street,	do.
*Fenton, Francis G.,	Ligoniel.
Ferguson, Godfrey W., Donegall Park,	Belfast.
Finlay, Robert H. F., Hughenden Avenue,	do.

Finlay, Fredk. W., Wolfhill House, Ligoniel.
FitzGerald, Professor Maurice F., B.A., M.I.M.E., Assoc. M.I.C.E., Eglantine Avenue, Belfast.

*Getty, Edmund (Representatives of), do.
Gibson, Andrew, Cliftonville Avenue, do.
Girdwood, Catherine, Mountpleasant,
Gordon, Robert W., J.P., Bangor.
Graham, Thomas, J.P., Holywood.
*Grainger, Rev. Canon, D.D., M.R.I.A. (Representatives of), Broughshane.
Gray, William, M.R.I.A., Glenburn Park, Cavehill Road, Belfast.
Greenhill, John H., Mus. Bac., Fortwilliam Park, do.
Greer, Thomas, J.P., M.R.I.A., Seapark, Carrickfergus.

*Hall, Frederick H., Waterford.
*Hamilton Hill, J.P., (Representatives of), Belfast.
Harland, Sir E. J., Bart., J.P. (Representatives of),
Heburn, William (Representatives of), Belfast.
Henderson, Miss Anna S. (Representatives of), do.
Henderson, James, A.M., Oakley, Windsor Park, do.
Henderson, Robert (Representatives of), London.
Herdman, John, J.P., Carricklee House, Strabane.
*Herdman, Robert Ernest, Rosano, Cultra.
Heyn, James, A.M., Strandtown House, Belfast.
Hind, John, jun., Clifton Park Avenue, do.
Hodges, Professor John F., M.D., F.C.S., F.I.C., J.P., Sandringham, Belfast.
Hogg, John, Academy Street, do.
Horner, John, Mount Clifton, Cliftonville, do.
*Houston, John Blakiston, J.P., V.L., Orangefield, do.
*Hughes, Edwin, Mertoun Hall, Holywood.
Hyndman, Hugh, LL.D., Windsor, Belfast.

Inglis, James, J.P., Abbeyville, Whiteabbey.

Jackson, A. T., C.E., Tighnabruaich, Derryvolgie Avenue, Belfast.
Jaffé, Otto, Kin Edar, Strandtown, do.
Johnston, Samuel A., J.P., Dalriada, Whiteabbey.

Kennedy, James, J.P., Richmond Lodge, Belfast.
Kennedy, William (Representatives of), Kenbella House, do.
Kertland, Edwin H., Malone House, do.
Kidd, George, J.P., Lisnatore, Dunmurry.
*Kinghan, Rev. John (Representatives of), Belfast.
Kyle, Robert Alexander, Ardstratha, Antrim Road, do.

Lanyon, John, C.E., Lisbreen, Fortwilliam Park, do.
Larmor, Joseph, M.A., St. John's College, Cambridge.
Leathem, John G., Victoria Gardens, Windsor Park, Belfast.
Lemon, Archibald Dunlap, J.P., Edgecumbe, Strandtown, do.
Lepper, F. R., Elsinore, Carnalea, Co. Down.
Letts, Professor E. A., Ph.D., F.C.S., Avonmore, Craigavad.
Lindsay, James A., M.A., M.D., Victoria Place, Belfast.
Lytle, David B., J.P., Bloomfield House, do.
Lytle, Joseph H., J.P., Ashleigh, Windsor Avenue, do.

Macassey, L. Livingstone, B.L., M.I.C.E., Stanley House, Holywood.
Macfarlane, John, Blandon Park, Belfast.
Mackenzie, John, C.E., Strathavon, Lisburn Road, do.
*Macrory, A. J. (Representatives of), do.
Magill, J. E., Easton Terrace, Cliftonville, do.
Malcolm, Bowman, Ashley Park, Antrim Road, do.
Maxton, James, The Elms, Strandtown.
Maxwell, David A., College Gardens, Belfast.
Milligan, Seaton Forest, M.R.I.A., Alberta, Malone Road, do.
Mitchell, Robert A., Marmont, Strandtown.
Montgomery, Henry C., Newton Lodge, Newtownbreda.

Montgomery, H. H., Magee's Road, Strandtown, Belfast.
Montgomery, Thomas, J.P., Ballydrain House, Dunmurry.
Moore, James, The Finaghy, Belfast.
Mullan, William, Lindisfarne, Marlborough Park, do.
Murney, Henry, M.D., J.P., Tudor House, Holywood.
*Murphy, Isaac James, Armagh.
*Murphy, Joseph John (Representatives of), Belfast.
Murray, Robert Wallace, J.P., Fortwilliam Park, do.
Musgrave, Edgar, Drumglass, Malone, do.
*Musgrave, Henry, Drumglass, Malone, do.
Musgrave, James, J.P., Drumglass, Malone, do.
MacAdam, Robert (Representatives of), do.
M'Bride, Henry James, Glenalina, do.
M'Bride, Samuel, Westbourne, Windsor, do.
*M'Calmont, Robert (Representatives of), London.
*M'Cammon, Lieut.-Col. Thomas A., Woodville, Holywood.
M'Cance, H. J., J.P., D.L., Larkfield, Dunmurry.
M'Clure, Sir Thomas, Bart., J.P., D.L. (Reps. of),
MacColl, Hector, Saxonia, Strandtown, Belfast.
MacCormac, John, M.D., Victoria Place, do.
M'Cormick, Hugh M'Neile, Ardmara, Craigavad.
*M'Cracken, Francis (Representatives of),
M'Gee, James, Woodville, Holywood.
M'Gee, Samuel Mackey, University Street, Belfast.
MacIlwaine, John H., Upper Crescent, do.
*MacLaine, Alexander, J.P., Queen's Elms, do.
M'Neill, George, Beechleigh, Malone Road, do.
M'Knight, John P., Nevara, Chichester Park, do.

Neill, Sharman D., Rowandean, Marlborough Park, do.
Nicholson, Henry J., West Elmwood, do.

O'Neill, James, M.A., College Square East, do.
*O'Rorke, Ambrose Howard, Tinnamara, Greenisland.

Park, Rev. Wm., M.A., Somerset Ho., University St., Belfast.

Patterson, Edward Forbes, College Gardens, Belfast.
Patterson, Mrs. Isabelle, Bonn, Germany.
Patterson, Richard, J.P., Kilmore, Holywood.
*Patterson, Robert Lloyd, J.P., F.L.S., Croft House, do.
Patterson, Robert, Osborne Park, do.
Patterson, William H., M.R.I.A., Garranard, do.
Patterson, William R., College Park East, do.
Pim, Edward, W., Elmwood Terrace, do.
Pim, Joshua, Slieve-na-Failthe, Whiteabbey.
*Pirrie, Elizabeth, Newcastle-on-Tyne.
Pooler, Rev. L. A., B.A., Lake Cottage, Downpatrick.
Praeger, R. Lloyd, B.E., M.R.I.A., National Library, Dublin.
Purser, Prof. John, LL.D., M.R.I.A., Queen's College, Belfast.

Rea, John Henry, M.D., Shaftesbury Square, do.
Rea, William R., Gardha, Fortwilliam Park, do.
Reade, Robert H., J.P., Wilmont, Dunmurry.
Riddel, William, J.P. (Representatives of), Belfast.
Robertson, William, J.P., Netherleigh, Strandtown, do.
Robinson, John, Sydenham Road, do.

Scott, R. Taylor, Richmond Villa, Derrivolgie Avenue, do.
Sheldon Charles, M.A., D.Lit., B.Sc., Royal Acad. Institution, do.
Shillington, Thomas Foulkes, Dromart, Antrim Road, do.
Simms, Felix Booth, Queen Street, do.
Sinclair, Thomas, M.A., J.P., D.L., Hopefield, do.
Sinclair, Prof Thomas, M.D., F.R.C.S. Eng., Howard St., do.
Smith, John, Garmoyle Terrace, do.
Smyth, John, M.A., C.E., Milltown, Banbridge.
Speers, Adam, B.Sc., Riversdale, Holywood.
Steen, Robert, Ph.D. (Representatives of), Belfast.
Steen, William, B.L., Northern Bank, Victoria Street, do.
Stelfox, James, Oakleigh, Ormeau Park, do.
Swanston, William, F.G.S., Cliftonville Avenue, do.
*Tennent, Robert (Representatives of), Rushpark, do.

*Tennent, Robert James (Reps. of), Rushpark,	Belfast.
Thompson, E. M'C., Waring Street,	do.
*Thompson, James, J.P., Macedon,	Whiteabbey.
Torrens, Mrs. Sarah H. (Representatives of),	do.
*Turnley, John (Representatives of),	Belfast.
Valentine, G. F., Sandhurst, Knock,	do.
Walkington, Mrs., Thornhill, Malone,	do.
Walkington, Thomas R., Edenvale, Strandtown,	do.
Wallace, John, Chlorine Gardens, Malone Road,	do.
Ward, Francis D., J.P., M.R.I.A., Elmwood Avenue,	do.
Ward, Isaac, Lisburn Road,	do.
Ward, John, J.P., Lennoxvale, Malone Road,	do.
*Webb, Richard T., Knock,	do.
Whitla, Prof. William, M.D., J.P., College Sq. North,	do.
Wilson, James, M.E., Oldforge,	Dunmurry.
Wilson, John K., Inch Marto, Marlborough Park,	Belfast.
Wilson, Walter H., Stranmillis House,	do.
*Wilson, W. Perceval,	do.
*Wolff, G. W., M.P., The Den, Strandtown,	do.
Workman, Francis, Drummena, Bladon Park,	do.
Workman, John, J.P., Lismore, Windsor,	do.
Workman, Rev. Robert, M.A., Rubane House,	Glastry.
Workman, Rev. Robert, B.D., The Manse,	Newtownbreda.
Workman, R. D., Upper Crescent,	Belfast.
*Workman, Thomas, J.P., Craigdarragh,	Craigavad.
Workman, William, Nottinghill,	Belfast.
Wright, James, Lauriston, Derryvolgie Avenue,	do.
Wright, Joseph, F.G.S., Alfred Street,	do.
Young, Robert, C.E., Rathvarna,	do.
*Young, Robert Magill, B.A., Rathvarna,	do.

HONORARY MEMBER.

Stokes, Miss M., Hon. M.R.I.A., Carrig Breac, Howth, Co. Dublin.

HONORARY ASSOCIATES.

Gray, William, M.R.I.A., Mountcharles,	Belfast.
Stewart, Samuel Alex., F.B.S. Edin., Belfast Museum,	do.
Swanston, William, F.G.S., Cliftonville Avenue,	do.
Tate, Prof. Ralph, F.G.S., F.L.S., Adelaide,	South Australia.
Wright, Joseph, F.G.S., Alfred Street,	Belfast.

ANNUAL SUBSCRIBERS OF TWO GUINEAS

Belfast Banking Company, Ltd.,	Belfast.
Northern Banking Company, Ltd.,	do.
Ulster Bank, Ltd.,	do.
York Street Spinning Company, Ltd.,	do.

ANNUAL SUBSCRIBERS OF ONE GUINEA.

Allan, C. E., Stormount Castle,	Dundonald.
Armstrong, William, Fortwilliam Terrace,	Belfast.
Barnett, R. M., M.D., M.R.C.S.Eng., Pakenham Place,	do.
Barr, James, Beechleigh, Windsor Park,	do.
Barton, H. D. M., The Bush,	Antrim.
Boyd, John, Southview Villas, Strandtown,	Belfast.
Brown, G. Herbert, J.P., Tordeevra,	Helen's Bay.
Bruce, James, D.L., J.P., Thorndale House,	Belfast.
Carr, James, Rathowen, Windsor,	do.
Cleaver, A. S., B.A., Dunraven,	do.
Craig, James, J.P., Craigavon, Strandtown,	do.
Crawford, F. H., Chlorine House, Malone Road,	do.
Dalton, J. P., M.A., Roseberry Villa, Antrim Road,	do.
Davidson, S. C., Killaire House,	Crawfordsburn.
Davies, A. C., Glenmore Cottage,	Lisburn.
Dunville, Robert G., J.P., D.L., Redburn,	Holywood.
Foster, Thos. A., Clonsilla, Antrim Road,	Belfast.
Gamble, James, Royal Terrace,	do.

Green, Isaac, Ann Street,	Belfast.
Hanna, J. A., Marietta, Knock,	do.
Hazelton, W. D., Cliftonville,	do.
Higginbotham, Granby, Wellington Park,	do.
Johnston, James, Ivy Dene, Antrim Road,	do.
Jones, A. L., Waring Street,	do.
Jones, R. M., M.A., Royal Academical Institution,	do.
Kelly, W. Redfern, M.I.C.E, F.R.A.S., Dalriada, Malone Park,	do.
Lynn, William H., Crumlin Terrace,	do.
Malone, John, Brookvale House, Cliftonville,	do.
Matier, Alexander S., Lorne,	Craigavad.
Milligen, John, Clonavor, Strandtown,	Belfast.
Murdoch, James, Ponsonby Avenue,	do.
M'Causland, William, Cherryvale House,	do.
M'Kee, William S., Fleetwood Street,	do.
M'Laughlin, W. H., Brookville House,	do.
Paul, Thomas, Redcot, Knock,	do.
Redfern, Prof. Peter, M.D., F.R.C.S.I., Lower Crescent,	do.
Ross, Wm. A., Iva Craig,	Craigavad.
Scott, Conway, C.E., Annaville, Windsor Avenue,	Belfast.
Swiney, J. H. H., B.A., B.E., Bella Vista, Antrim Road,	do.
Tate, Alexander, C.E., Rantalard, Whitehouse,	do.
Thompson, John, Limestone Road,	do.
Turpin, James, Waring Street,	do.
Walkington, R. B., Carriggorm,	Helen's Bay.
Withers, James, Lawrence Street,	Belfast.

Report and Proceedings

OF THE

BELFAST NATURAL HISTORY & PHILOSOPHICAL SOCIETY

FOR THE

SESSION 1896-7.

BELFAST:
PRINTED BY ALEXR. MAYNE & BOYD, 2 CORPORATION STREET
(PRINTERS TO QUEEN'S COLLEGE).

1897.

CONTENTS.

Belfast Natural History and Philosophical Society.

ESTABLISHED 1821.

SHAREHOLDERS.

1 Share in the Society	costs	£7.
2 Shares ,,	cost	£14.
3 Shares ,,	cost	£21.

The Proprietor of 1 Share pays 10s. per annum; the Proprietor of 2 Shares pays 5s. per annum; the Proprietor of 3 or more Shares stands exempt from further payment.

Shareholders are only eligible for election on the Council of Management.

MEMBERS.

There are two classes—Ordinary Members, who are expected to read papers, and Visiting Members, who, by joining under the latter title, are understood to intimate that they do not wish to read Papers. The Session for Lectures extends from November in one year till May in the succeeding one. Members, Ordinary or Visiting, pay £1 1s. per annum, due 1st November in each year.

Each Shareholder and Member has the right of personal attendance at all meetings of the Society, and of admitting a friend thereto; also of access to the Museum and Library for himself and family, with the privilege of granting admission orders for inspecting the collections to any friend not residing in Belfast.

Any further information can be obtained by application to the Secretary. It is requested that all accounts due by the Society be sent to the Treasurer.

The Museum, College Square North, is open daily from 10 till 4 o'clock. Admission for Strangers, 6d. each. The Curator is in constant attendance, and will take charge of any Donation kindly left for the Museum or Library.

Belfast Natural History and Philosophical Society.

ANNUAL REPORT, 1896.

THE Annual Meeting of the Belfast Natural History and Philosophical Society was held yesterday at the Museum, College Square North. Professor Everett, President, occupied the chair, and the attendance included—Messrs. T. F. Shillington, John Brown (Hon. Treasurer), Robert Young, J.P.; Robert Lloyd Patterson, J.P., F.L.S.; W. H. Patterson, Wm. Swanston, J.P.; John Horner, Robert M. Young, J.P., M.R.I.A. (Hon. Secretary); Thomas Workman, J.P.; Lavens M. Ewart, J.P.; Isaac Ward, William Farren, Ed. Allworthy, John Finnegan, B.SC.; Dr. Sheldon, Dr. Leathem, Dr. MacCormac.

The HON. SECRETARY read the report of the Council, which was as follows :—" The Council of the Belfast Natural History and Philosophical Society desire to submit their report of the working of the Society during the past year. The winter session was opened on the 3rd November, 1896, in the Museum, when the President of the Society (Professor J. D. Everett, F.R.S.), delivered an inaugural address — subject, 'Recent Advances in Electricity.' The second meeting was held on 1st December, when the following papers were read :—'Dante,' by Dr. J. A. Lindsay ; 'A Recent Discovery of Worked Flints in Submerged Peat at Portrush,' by Mr. W. H. Patterson, M.R.I.A.; and 'Report of the Society's Delegate to the British Association Meeting, 1896,' by Mr. Alex. Tate, M.I.C.E. The third

meeting was held on 5th January, 1897, when Mr. L. L. Macassey, B.L., read a paper entitled 'A Run Through the Mourne Mountains,' illustrated with a series of photo slides by Mr. R. Welch. The fourth meeting was held on 9th February, when the following papers were read 'The Mystery of Indian Fakirism.' by Dr. Hermann Walter, and 'Contouring with Barometer in the Mourne Mountains,' by Professor M. F. Fitzgerald, B.A. The fifth meeting was held on 2nd March, when Mr. S. F. Milligan, M.R.I.A., gave a lecture—subject, 'Ireland, its Ancient Civilisation and Social Customs,' illustrated with a series of photo slides. Mr. Joseph Wright, F.G.S., also read a paper on 'Boulder Clay: A Marine Deposit, with Special Reference to the Till of Scotland.' The sixth was a special meeting, held on the 17th of March, when Mr. John Finnegan, B.SC., read a paper—subject, 'The History and Properties of Röntgen Rays,' fully illustrated, with special experiments and lantern photo slides. The seventh meeting was held on 6th April, when Mr. E. W. MacBride, M.A., kindly lectured on 'Starfish and Sea Urchins, their Haunts, Habits, and History,' illustrated by special lantern slides. In addition to the foregoing lectures, your Council arranged for two lectures on the Cinematograph, which were given by Mr. W. Nicholl in the Ulster Minor Hall on 27th and 28th February to appreciative audiences. All the meetings of the Society were well attended, and at several numbers had to be refused admittance owing to the want of accommodation in the lecture-hall. The meetings of kindred societies continue to be held in the Museum, and the Ulster Medical Society, after some years of absence, has again rented the room known as the library, with daily access for its members. The Belfast Naturalists' Field Club, Ulster Amateur Photographic Society, also the Belfast Mechanical and Engineering Association continue to meet regularly in your rooms. The Museum collections have been augmented by some valuable additions, which are incorporated with the pre-existing series, and displayed as well as space limits permit. It is, however, to be regretted that the specimens

have to be very much crowded, which makes their seemly arrangement a matter of difficulty. Some examples of the rarer local mollusca have been placed in the conchological cabinet, also a few further geological specimens have been added, and some imperfect fossils have been replaced by others in a better state of preservation, and a good number of plants have been added to the local herbarium. It will be observed from the Treasurer's statement of accounts that the finances of the Society continue in a satisfactory condition, with a substantial balance in hands. Several new members have joined the Society. As is customary on Easter Monday and Tuesday, the Museum was opened to the public at a nominal charge. Several interesting objects were lent by Mr. W. Swanston, F.G.S., and the attendance of the public was considerable. The duties of the Curator continue to be efficiently discharged by Mr. S. A. Stewart, in which he has the assistance of Mr. Sinclair, sub-curator. On the occasion of the meeting of the Journalists' Institute in Belfast last September a selection of valuable newspapers and books from the library were exhibited, and attracted much attention. Your Council unanimously elected the Marquis of Dufferin and Ava as an honorary member on his Lorship's return to Clandeboye. The Council desire to render their best thanks to the local Press for their admirable reports of the various meetings of the Society. In accordance with the constitution of the Society, this meeting will be asked to elect five members of Council for the ensuing year in place of the following gentlemen who retire by rotation, but are eligible for re-election :—Thomas Workman, J.P.; R. M. Young, Professor J. D. Everett, F.R.S.; T. F. Shillington, Lavens M. Ewart, J.P."

The Hon. Treasurer submitted the financial statement, which showed a small balance to credit.

The President, in moving the adoption of the reports, said he thought they had had a fairly satisfactory year. The papers had been up to the average, and the subscriptions showed a move in the right direction.

Dr. MacCormac seconded the motion, which was adopted.

The meeting then proceeded to ballot for five members of Council in room of those who retired by rotation. Messrs. Horner and Swanston, who acted as scrutineers, reported the result of the ballot to be the unanimous re-election of the retiring members.

Mr. Allworthy, in moving a vote of thanks to the President for his services during the past year, said he had known Professor Everett almost from the time he first became connected with the Queen's College—nearly thirty years ago. He was sorry to hear that he had resigned, or was about to resign, that connection. Professor Everett had added lustre to the history of the College during that long period, and had distinguished himself not only in connection with that institution, but throughout the United Kingdom in regard to the metric system, shorthand, electricity, and cycling. He possessed in fact a record which very few would be able to equal. With regard to his position as President of that Society, a better man could not have filled the chair, and it was to be hoped that they would not be asked to part with him at the expiration of his year of office.

Mr. Wm. Faren seconded the proposition, which was passed with acclamation.

This concluded the business of the meeting.

Subsequently a meeting of Council was held, at which the office-bearers were all re-elected—Professor Everett as President, Mr. John Brown as Hon. Treasurer, and Mr. R. M. Young as Hon. Secretary.

EDUCATIONAL ENDOWMENTS (IRELAND) ACT, 1885, 48 & 49 Vict., ch. 78.

The Account of the Council of the Belfast Natural History and Philosophical Society for the Year ended 30th April, 1897.

Dr. | **Cr.**

CHARGE.

To Balance as per last Account				£9	18	3
,, Amount of Donations, Bequests, and other Endowments received in the year ended 30th April, 1897				3	10	0
,, Amount of Subscriptions received in the year ended 30th April, 1897				127	4	0
,, Amount of Dividends received in the year ended 30th April, 1897				17	8	0
,, Amount of Rents received in the year ended 30th April, 1897				25	2	0
,, Amount of Fees received in the year ended 30th April, 1897				0	5	0
,, Amount of Miscellaneous Receipts in the year ended 30th April, 1897 (not included in the foregoing), viz.:—						
Entrance fees at door on Easter Monday	£16	6	8			
Do. do. Tuesday	4	1	6			
Do. For year ending April 30th	25	4	6			
				45	12	8
Total, ...				£228	19	11

DISCHARGE.

By Amount of Payments made in the year ended 30th April, 1897, under the following headings—						
Maintenance of Premises, &c. ...	£22	2	6½			
Rent and Taxes, &c.	27	11	0			
Salaries	87	13	6			
				137	7	0½
Other Payments, viz.—						
Printing and Stationery	18	1	1			
Advertising	7	10	8			
Postage and Carriage	6	5	8½			
Fuel and Gas	15	12	11			
Insurance	10	11	6			
Auditor's Fee	1	1	0			
Contract Stamps	0	6	6			
Subscription to *Irish Naturalist* ...	1	1	0			
Expenses at Easter	7	13	1			
Deficit on Lecture Account ...	0	3	8			
				68	7	1½
Total Payment				£205	14	2
,, Balance in favour of this Account on the 30th April, 1897				23	5	9
Total				£228	19	11

N.B.—Besides the above Balance there is a sum of £400 standing to the credit of this Account in the York Street Spinning Co., Ltd., 4½ per cent. Debenture Stock.

We certify that the above is a true Account.

WM. SWANSTON, Governor.
J. BROWN, Accounting Officer.

Dated this 20th day of May, 1897.

I certify that the foregoing Account is correct.

J. F. MAYNE, Auditor.
26th day of May, 1897.

DONATIONS TO THE MUSEUM, 1896-97.

From MATTHEW HALL, Esq.

A goat's kid which was born with eight legs.

From Mrs. Dr. J. WALTON BROWNE.

An inlaid Indian Matchlock.

From Lieut.-Col. G. BERESFORD KNOX, J.P.

A wooden mether filled with Bog Butter, found in Co. Derry.

A number of Irish stone celts and stone beads; also, Italian carvings and medals, and a large number of Italian geological specimens.

From W. J. M'KINNEY, Esq., Ballyvesey.

A badge and buttons of Whitehouse Volunteer Company, 1782, also, specimen of a Coral (*Tubipora musica*) dug up at Ahoghill in 1848.

From JOSEPH ENGLISH, Esq., Crumlin.

The skin of a Zebra (*Equus zebra*) from South Africa.

From CHARLES BULLA, Esq.

Two univalve fossils (*Turbo tiara*) from the Carboniferous Limestone near Enniskillen.

From THE DEAN OF DROMORE.

A specimen of the mink (*Puteolus vison*) from Tambillo, . America.

From W. H. M'LAUGHLIN, Esq.

A carved stone (*grotesque lion's head*) from the old Belfast Castle, Castle Place; also, piece of an oak beam from same castle.

From WILLIAM GRAY, Esq., M.R.I.A.

Five enlarged photographs of animals in the London Zoological Gardens.

ADDITIONS TO THE LIBRARY, 1ST MAY, 1896, TILL 1ST MAY, 1897.

ADELAIDE.—Transactions of the Royal Society of South Australia. Vol. 16, part 3, 1896; vol. 20, parts 1 and 2, 1896. *The Society.*

ALBANY.—Forty-seventh Annual Report of the Regents of New York State Museum, 1894. *The Director.*

AUSTIN, TEXAS.—Transactions of the Texas Academy of Science. Vol. 1, no. 5, 1897. *The Academy.*

BELFAST.—Proceedings of the Belfast Naturalists' Field Club. Ser. 2, vol. 4, part 3, 1896. *The Club.*

BERGEN.—Bergens Museums Aarbog for 1896; also, Account of the Crustacea of Norway, by G. O. Sars. Vol. 2, Isopoda, part 1. *The Director of the Museum.*

BERLIN.—Verhandlungen der Gesellschaft für Erdkunde zu Berlin. Vol. 23, nos. 4—10, 1896; and vol. 24, nos. 1—3, 1897. *The Society.*

BOLOGNA.—Rendiconto delle Sessioni della R. Accademia delle Scienze dell' Istituto di Bologna. Anno 1895. *The Academy.*

BOSTON.—Proceedings of the Boston Society of Natural History. Vol. 27, pp. 1—241, 1896. *The Society.*

BREMEN.—Abhandlungen Herausgegeben vom Naturwissenschaftlichen Vereine zu Bremen. Vol. 13, part 3, 1896; and vol. 14, part 1, 1895. *The Society.*

BRESLAU.—Zeitschrift für Entomologie Herausgegeben vom Verein für Schlessiche Insektenkunde zu Breslau. Part 21, 1896; also Festschrift, 1897. *The Society.*

BRIGHTON.—Annual Report of Brighton and Sussex Natural History, 1896. *The Society.*

BUENOS AYRES.—Anales del Museo Nacional de Buenos Aires. Ser. 2, vol. 1, 1895. *The Director.*

CALCUTTA.—Records of the Geological Survey of India. Vol. 29, parts 2—4, 1896; and vol. 30, part 1. 1897. Also, Memoirs. Vol. 27, part 1, 1895. And Palæontologia Indica. Ser. 13, vol. 2, 1895; and ser. 15, vol. 2, part 2, 1895. *The Director of the Survey.*

CAMBRIDGE.—Proceedings of the Cambridge Philosophical Society. Vol. 9, part 2, 1896; and part 4, 1897. *The Society.*

CAMBRIDGE, MASS.—Bulletin of the Museum of Comparative Zoology. Vol. 28, no. 1, 1895; and nos. 2 and 3, 1896; vol. 29, nos. 1—6, 1896; vol. 30, nos. 1—3, 1896; and no. 4, 1897. Also, Annual Report of the Curator for 1895-96. *Alex. Agassiz, Curator.*

CARDIFF.—Report and Transactions of the Cardiff Naturalists' Society. Vol. 27, part 2, 1895; and vol. 28, part 1, 1896. *The Society.*

CASSEL.—Abhandlungen and Bericht (41) des Vereins für Naturkunde zu Kassel, 1896. *The Society.*

CHICAGO.—Thirty-eighth Annual Report of the Chicago Academy of Sciences, 1895. Also Bulletin. Vol. 2, no. 2, 1896; and Journal of Geology. Vol. 4, no. 5, 1896. *The Academy.*

CHRISTIANIA.—Forhandlinger i Videnskabs Selskabet i Christiania. Nos. 1—10, 1894; and no. 11, 1895. Also volume of Forhandlinger for 1895, and Oversigt for 1894. Videnskabs Selskabets Skrifter, 10 nos., 1894, and 2 nos. 1895. Also Samlede Philologiske Afhandlinger, of Prof.

P. O. Schjott, 1896; and Fauna Norvegiæ, of Prof. G. O. Sars. Vol. 1, 1896.
The Royal University of Christiania.

COLORADO SPRINGS.—Colorado College Studies. Vol. 6, 1896.
Colorado College Scientific Society.

EDINBURGH.—Transactions and Proceedings of the Botanical Society of Edinburgh. Vol. 20, part 2, 1895; and part 3, 1896. *The Society.*

„ Proceedings of the Royal Society of Edinburgh. Vol 20, 1893—95. *The Society.*

„ Proceedings of the Royal Physical Society. Session 1895-6. *The Society.*

ELBERFELD.—Jahres Bericht de Naturwissenschaftlichen Vereins zu Elberfeld. Part 8, 1896.
The Society.

EMDEN.—Jahresbericht der Naturforschenden Gesellschaft in Emden, pro 1894-95. 1896. *The Society.*

GENOA.—Giornale della Societá di Letture e Conversazione Scientifiche di Genova. Anno 18, fasc. 2 and 3, 1896; fasc. 4, 1897; and anno 19, fasc. 1, 1897. *The Society.*

GIESSEN.—Bericht der Oberhessischen Gesellschaft für Natur und Heilkunde, 1896. *The Society.*

GLASGOW.—Transactions of the Glasgow Geological Society. Vol. 10, part 2, 1896. *The Society.*

Transactions of the Natural History Society of Glasgow. New Series, vol. 4, part 2, 1896.
The Society.

Proceedings of the Glasgow Philosophical Society. Vol. 27, 1896. *The Society.*

HALIFAX, NOVA SCOTIA.—Proceedings and Transactions of the Nova Scotian Institute of Science. Vol. 9, part 1, 1896. *The Institute.*

IGLO.—Jahrbuch des Ungarischen—Karpathen Vereins. Twenty-third year, 1896. *The Society.*

JALAPA, VERA CRUZ.—Boletin Mensual del Observatorio Meteorologico Central del Estado de Veracruz. Feb.—Dec., 1896; and Jany.—Feby., 1897. *The Director.*

KHARKOW—Travaux de la Société de Medecine Scientifique. Two parts, 1896-97. Also Travaux de la Société des Sciences Physico-Chimiques. Part 1, 1895. *The University.*

LAUSANNE.—Bulletin de la Société Vaudoise des Sciences Naturelles. Series 4, vol. 31, no. 119, 1895; and vol. 32, nos. 120—122, 1896. *The Society.*

Index Bibliographique de la Faculté des Sciences de la Université de Lausanne, 1896. *The University.*

LEIPSIC.—Mitteilungen des Vereins für Erdkunde zu Leipzig. Two parts, 1896 and 1897. Also Baumann, "Die Insel Sansibar," part 1, 1896; and part 2, 1897. *The Society.*

LONDON.—General Index to vols. 30—42 of Monthly Notices of the Astronomical Society, 1896. *The Society.*

Report of the Meeting of the British Association at Liverpool, 1896. *The Association.*

Quarterly Journal of the Geological Society of London. Vol. 42, nos. 206—208, 1896; and vol. 43, no. 209, 1897. Also Geological Literature added to the Library during 1896, and General Index to First Fifty vols. of Journal, part 1, 1897. *The Society.*

Journal of the Royal Microscopical Society. Parts 111—115, 1896; and part 116, 1897. *The Society.*

Transactions of the Zoological Society of London. Vol. 14, part 2, 1896; and part 3, 1897. Proceedings, part 4, 1895; parts 1—4, 1896; and List of Animals, 1896. *The Society.*

MADISON.—Transactions of the Wisconsin Academy of Sciences, Arts, and Letters. Vol. 10, 1896.
The Academy.

MADRAS.—Bulletin of Madras Government Museum, Anthropology. Vol. 1, no. 4, 1896; and vol. 2, no. 1, 1897. Also Administration Report for 1895-96.
The Superintendent.

MANCHESTER.—Transactions of the Manchester Geological Society. Vol. 24, parts 8—10, 1896; and vol. 25, parts 1—3, 1897. *The Society.*

Journal of Manchester Geographical Society. Vol. 10, nos. 9—12, 1894; vol. 11, nos. 4—9, 1895; and vol. 12, nos. 1—3, 1896. *The Society.*

Transactions and Report of Manchester Microscopical Society, 1895. *The Society.*

MARSEILLES.—Annals de la Faculte des Sciences de Marseillê. Vol. 5, fasc. 4, 1896; and vol. 6, fasc. 1—3, 1897. Also vol. 7, 1896. *The Librarian.*

MELBOURNE.—Transactions of the Royal Society of Victoria. Vol. 4, 1895; and Proceedings. New Series, vol. 8, 1896. *The Society.*

MERIDEN, Conn.—Transactions of the Meriden Scientific Association. Vol. 7, 1895. *The Association.*

MEXICO.—Boletin del Observatorio Astronomico Nacional de Tacubaya. Vol. 1, Nos. 24 and 25, 1896. Also, Boletin Mensual del Observatorio Meterologico Central de Mexico. Jany.—Dec., 1896 and Jany., 1897. *The Director.*

MINNEAPOLIS.—Bulletin of the Minnesota Academy of Natural Sciences. Vol. 4, no. 1, part 1, 1896.
The Academy.

MOSCOW.—Bulletin of the Imperial Society of Naturalists of Moscou. Nos. 1—3, 1896. *The Society.*

NANTES.—Bulletin de la Société des Sciences Naturelles de l' Ouest de la France. Vol. 5, no. 4, 1895; and vol. 6, nos. 1 and 2, 1896. *The Society.*

NEW YORK.—Annals of New York Academy of Sciences. Vol. 9, nos. 1—3, and Index to vol. 8, 1896. Also Memoir 1, part 1, "Declinations and Proper Motions of fifty-six stars," 1895. *The Academy.*

Bulletin of the American Geographical Society. Vol. 28, nos. 1—4, 1896. *The Society.*

ODESSA.—Memoirs of the Society of Naturalists of New Russia. Vol. 17, part 1, 1895; and vol. 20, part 1, 1895. *The Society.*

OPORTO —Annaes de Sciencias Naturaes. Anno 3, nos. 2—4, 1896, and anno 4, no. 1, 1897. *The Editor.*

OTTAWA.—Annual Report of the Geological Survey of Canada. New Series, vol. 7, 1894. Also Geological Maps, nos. 556, 557, 561, 562, 563, 567, 571. *The Director.*

PADUA.—Bullettino della Società Veneto Trentina di Scienze Naturali. Vol. 6, no. 2, 1896. *The Society.*

PENZANCE.—Report of Penzance Natural History and Antiquarian Society, 1894—97. *The Society.*

PHILADELPHIA.—Proceedings of the Academy of Natural Sciences of Philadelphia. Parts 1 and 2, 1896. *The Academy.*

Proceedings of the American Philosophical Society. Vol. 34, no. 149, 1895; and vol. 35, nos. 150—152, 1896. *The Society.*

Transactions of Wagner Free Institute of Science. Vol. 4, 1896. *The Institute.*

PISA.—Atti della Società Toscana di Scienze Naturali, Processi Verbali. Vol. 10, Nov. 1896 till Jany. 1897. *The Society.*

REIGATE.—Proceedings of Holmesdale Natural History Club, for years 1893—95. *The Club.*

ROCHESTER, N.Y.—Proceedings of the Rochester Academy of Science. Vol. 3, brochure 1, 1896. *The Academy.*

ROME.—Atti della Reale Accademia dei Lincei. Series 5, vol. 5, semestre 1, fasc 7—12, 1896; and semestre 2, fasc 1—12, 1896; vol. 6, semestre 1, fasc 1—7, 1897; also Rendiconto dell'adunanza Solenne, June, 1896. *The Academy.*

Bullettino della Societá Romana per gli studi Zoologici. Vol. 5, fasc. 1—6, 1896. *The Society.*

SAN FRANCISCO.—Proceedings of the California Academy of Sciences. Series 2, vol. 5, part 2, 1896. *The Academy.*

SANTIAGO DE CHILI.—Verhandlungen des Deutschen Wissenschaftlichen Vereins zu Santiago de Chile. Vol. 3, parts 3 and 4, 1896. *The Society.*

SHEFFIELD.—Annual Report of Sheffield Naturalists' Club, 1895. *The Club.*

STAVANGER.—Stavanger Museums Aarsberetning for 1895. *The Museum Trustees.*

STIRLING.—Transactions of Stirling Natural History Society, 1895—96. *The Society.*

STOCKHOLM.—Handlinger of Royal Swedish Academy. Vol. 27, 1896. Ofversigt, vol. 52, 1895; and Bihang, vol. 21, parts 1—4, 1896. *The Academy.*

TOKIO.—Mittheilungen der Deutschen Gesellschaft für Natur und Volkerunde Ostasiens in Tokio. Part 58 and Supplement, 1896-97. *The Society.*

TOPEKA, KANSAS.—Transactions of Kansas Academy of Science. Vol. 14, 1896. *The Academy,*

TORONTO.—Transactions of the Canadian Institute. Vol. 4, part 2, 1895; and vol. 5, part 1, 1896.
The Institute.

UPSALA.—Bulletin of the Geological Institution of the University of Upsala. Vol. 2, part 2, no. 4, 1896.
The Institution.

VENICE.—La Notarisia Neptunia. Vol. 11, no. 1, 1896.
The Editor.

VIENNA.—Verhandlungen der Kaiserlich Koniglichen Geologischen Reichsanstalt. Nos. 4—18, 1896; and nos. 1—5, 1897. *The Society.*

„ Verhandlungen der Kaiserlich-Koniglichen Zoologisch-Botanischen Gesellschaft. Vol. 46, parts 4—10, 1896. *The Society.*

WASHINGTON.—Fifteenth Annual Report of the Geological Survey of the United States, 1895. Sixteenth Annual Report, part 1, 1896; part 2, 1895; part 3, 1895; and part 4, 1895. Seventeenth Annual Report, part 3, 1896. Bulletin of the Geological Survey, nos. 123, 124, 125, 126, 128, 129, 131 and 133, 1895; also 132 and 134, 1896. *The Director.*

„ Report of the Secretary of Agriculture, North American Fauna. No. 10, Shrews; no. 11, Weasels of North America; no. 12, Voles and Lemmings, 1896.
The Department of Agriculture.

„ Report of the American Historical Association for the year 1894. *The Association.*

„ Smithsonian Report for year 1894. Smithsonian Contributions to Knowledge. Vols. 30—32, 1895; and no. 1033, "Argon, a New Constituent of the Atmosphere," 1896. Smithsonian Miscellaneous Collections, 1031, "Genera

and Species of Foraminifera," part 2, 1896. Also no. 1037, "Determination of Organic Matter in Air," 1896.

The Smithsonian Association.

" Thirteenth Annual Report of the Bureau of Ethnology, for the year 1891-92.

The Director of the Bureau.

YORK.—Annual Report of the Yorkshire Philosophical Society for year 1895. *The Society.*

ZURICH.—Festschrift der Naturforschenden Gesellschaft in Zurich, parts 1 and 2, 1896. Vierteljahrschrift, supplement, 1896; and 99th Neujahrsblatt, 1897.

The Society.

From Mons. CHARLES JANET.—Les Fourmis. Les Guepes. Les Abeilles, etc.; four papers, 1895—97.

From R. LLOYD PATTERSON, Esq., J.P., F.L.S.—Journal of the Linnean Society (Botany). Vol. 31, nos. 215—218, 1896, 219, 1897; and vol. 32, 1896.

From THOMAS WORKMAN, Esq., J.P.—Spiders, by T. Workman. Vol. 1, Malaysian Spiders, 1896. Also Exploration Scientifique de la Tunisie, Echinides Fossiles des Terrains Jurassiques de la Tunisie, 1896.

BELFAST
NATURAL HISTORY & PHILOSOPHICAL SOCIETY
SESSION 1896-97.

3rd November, 1896.

PROFESSOR J. D. EVERETT, F.R.S., D.C.L., delivered an Inaugural Address on

"RECENT ADVANCES IN ELECTRICITY."

QUITE a revolutionary change has come over the theory and practice of electricity and magnetism during recent years. It is not my purpose to-night to speak of the enormous advance which has been made in the means of producing electricity, and in modes of applying it to human wants, but rather of the change which has come over the thoughts of electricians in regard to the nature of electrical phenomena. Faraday laid the foundation of this change, and urged his views strongly in many passages of his "Experimental Researches;" at the same time that, by his discovery of the production of electric currents in wires by moving them in a magnetic field, he laid the foundation of the methods by which electricity is now universally supplied. According to the old views, non-conducting substances were regarded as simply blocking the way and preventing the escape of electricity from charged conductors. Faraday upset this view by showing as an experimental fact that the capacity of a condenser, though it is not changed by substituting one metal for another in the conducting portions of the arrange-ment, is materially changed by substituting one material for

another in the non-conducting portion. The best modern measurements have shown that the capacity is about nine times as great when the insulator is glass as when it is air. Faraday rejected as unthinkable the notion of direct attraction and repulsion between two things at a distance from one another, and maintained that they could only act upon one another through the co-operation of the intervening medium. Apparent attraction might be produced by a diminution of the pressure of the medium against the bodies on their near sides, and apparent repulsion by an increase of this pressure. He made great use of the conception of *lines of force* extending out all round an electrified conductor through the surrounding medium and connecting it with conductors at a distance which are charged with the opposite kind of electricity. These lines are not usually straight, but curved, and at every point in their length the resultant force is in the direction of a tangent. According to Faraday, these lines of force act like stretched strings which are tending to pull their two ends nearer together, but, unlike strings, each line repels its neighbours. Or, to state the view more precisely, if we divide up the whole non-conducting material into filaments, running in the direction of the lines of force, each filament is in a condition of longitudinal tension and is at the same time in a condition of lateral compression. These filaments are called tubes of force.

Clerk Maxwell, the great prophet of the modern school of electrical thought, adopts this view in every particular, and makes it mathematically precise. According to him, if you select any point at random in the air or other insulator through which the lines of force run, the tension at this point in the direction of the line of force is exactly equal to the pressure at the same point in every perpendicular direction. This tension (and its equal pressure) is not, however, the same at all points in the medium, but is greatest where the electrical force, as usually understood, is greatest, being, in fact, proportional to the square of the electrical force. If we travel in

imagination along one filament from end to end, the force varies inversely as the cross section of the filament ; hence the tension and pressure vary inversely as the square of the section. In the case of a liquid, or a gas, like the atmosphere, we must understand by tension a diminution of pressure, so that in a space pervaded by electrical force it is no longer true that a gas or liquid exerts equal pressure in all directions at a point ; on the contrary, it exerts minimum pressure in the direction of a line of electrical force, and maximum pressure in all directions at right angles to this. Such a distribution of mutual forces can be shown to be consistent with itself, and consistent with the equilibrium of the fluid. Any one who wishes for satisfaction on this point will find a very compact and intelligible proof in Prof. J. J. Thomson's recent book, "Elements of the Mathematical Theory of Electricity and Magnetism." He supposes a filament, or "tube of force," cut across by two sections near together, and shows that the forces which act upon the whole surface of the intercepted portion of the filament form an equilibrating system. The energy of a charged leyden jar, or of any system of charged conductors separated by an insulating medium, is to be regarded as of the same kind as the energy of a compressed or extended spring, and as residing not in the conductors, but in the intervening medium ; and calculation shows that, when systematic units are employed, the numerical value of the energy, per unit volume, at any point of the medium, is the same as the numerical value of the tension and pressure at this point. This also is proved very neatly and clearly in J. J. Thomson's book. Some kind of elastic yielding must be supposed to accompany the tension and pressure, otherwise no work would be done and no energy stored up. In one and the same substance the yielding is proportional to the force ; but in different substances it is very different for the same force, being proportional to the "specific inductive capacity." The yielding is not a distortion of the substance as a whole, but of its separate molecules. Its exact nature we do not know,

but whatever it is, the metals, if they undergo it, do not oppose elastic resistance to it; hence the kind of energy which it involves cannot be stored up in metals.

I have now to explain how the theory is applied to electric currents. Consider the case of an electrical current flowing through a wire which joins the two terminals of a galvanic cell. We must suppose each tube of force to stretch across in the first instance from the positive to the negative plate of the battery, and then to move along in such a manner that its ends or feet slide along the wire until they meet at the middle of its length. As its feet approach each other the tube shrinks in length, till it vanishes altogether. This operation of sliding warms the wire, the heat thus generated being the equivalent of the energy of the tubes which have disappeared. In like manner, in the discharge of a leyden jar, the force-tubes, which previously stretched across from one coating to the other, slide up to the place where the spark passes, and there shrink into nothing in mid-air, thereby heating the air. When a telegraphic current runs through a submarine cable, the tubes of force, which extend radially from the copper core to the external iron sheath through the intervening insulator, must be regarded as travelling along through the insulator, so that their two ends slide along these two conductors. The use of the copper core is to furnish a slide for one end of the tubes of force, for without two slides, one for each foot, they cannot travel. Here let me notice a remarkable result which has been brought out in the supply of electricity to a district by means of alternating currents. It is found that when the alternations are rapid it is a mistake to employ solid wires or rods for the mains, and that much less material will suffice if the mains are tubular. The axial portion of a solid wire is practically inoperative when the alternations are rapid; and it is possible for alternations to be so rapid that the currents are practically only skin deep. From the point of view of modern theory, the action on the wire begins at the surface, where the force-tubes slide upon it,

and, with rapid alternations, has not time to penetrate to the axis.

Maxwell developed Faraday's views, not only in the way of giving greater precision to the statement of them, but also by extending the meaning of the phrase, "electric current," to include certain electrical changes in non-conductors, and extending Faraday's laws for currents to these changes. He thus built up a theory of electro-magnetic waves in non conductors, according to which the magnetic force is perpendicular to the direction in which the wave advances, and the direction of electrostatic force is perpendicular to both of these. Thus, when there is a regular succession of waves of the simplest kind, there will be, at any given point in the medium, a magnetic force acting along a fixed line, and increasing from zero to a maximum, then diminishing to zero, increasing to a maximum in the opposite direction, and returning again to zero, to go through the same changes again. Similar remarks will apply to the electrostatic force which will also exist at the point acting along a line at right angles to the magnetic force; while the direction in which the waves advance will be perpendicular to both. Further, Maxwell deduced from his theory that the velocity with which electro-magnetic waves travel in air is the same as a certain velocity which electricians very frequently have to speak of, because they have to use it as a multiplier or a divisor whenever they want to pass from the electrostatic system of units to the electro-magnetic, or *vice-versa*. This velocity has been measured by electrical experiments in several different ways, and has been found by all experimenters to be about equal to the velocity of light. But if electro-magnetic waves travel with a velocity which is nearly or exactly the same as that of light, may not waves of light themselves be electro-magnetic waves? Maxwell says they are; and it is now established by a method of experiment originated by Hertz, that electro-magnetic waves very closely resemble waves of light in their behaviour, and that they travel with a velocity which is nearly or exactly that of light.

Hertz, though quite a young man, died a year or two after the publication of his remarkable results, which form an era in the history of electricity, but his work has been zealously taken up by others, and his methods of experiment have been in some respects improved. The favourite method now of obtaining Hertzian waves is to discharge the secondary coil of a Ruhmkorff through three metal knobs, of which the two outside ones, which are connected with the ends of the coil, are small, and the middle one much larger; the discharges being taken one at a time by hand, instead of being allowed to run on rapidly by the automatic make and break. As a receiver or analyser, to reveal the presence of the waves, one of the best methods is to employ a short tube of glass, filled with metal filings (called "Branly's coherer"), and to make this mass of filings form part of the circuit of a battery and galvanometer. When Hertzian waves fall upon the filings they give an instantaneous increase of conductivity, so that the galvanometer shows a stronger current. An improvement on this has been devised by Prof. Chunder Bose, of Calcutta, and consists in using, instead of a mass of filings, a row of small spiral springs, which are held at the ends by fixed supports, and touch each other at the sides with a contact which can be made more or less close by an adjusting screw, putting on more or less pressure.

Hertz showed that his rays could be reflected from metal plates, that they could be brought to a focus by a concave reflector, and that they could be refracted through a prism of suitable material. One of the best materials is pitch, which, though opaque to luminous waves, is transparent to Hertzian waves. Hertz also found that his waves were able to pass through brick walls and through floors and ceilings. In connection with such facts as these, we must remember that a piece of ordinary red glass is opaque to yellow and green light, though transparent to red. It is a question of the length of the waves; the yellow and green waves are not of the right length to get through. Hertzian waves are many thousands of times longer than light waves, and it is not surprising that media which are opaque to the one are transparent to the other.

The best determinations with which I am acquainted of the length of Hertzian waves are those which Prof. Bose has made by means of a diffraction grating. Hertz's own determinations were chiefly made by means of *resonators*, that is to say, by causing the waves to excite oscillating currents in a conductor, and choosing this conductor of such dimensions as would give the strongest oscillations. This method has been found so uncertain in its results as to excite a suspicion that the waves have not in each case a definite wave length. We know that the waves of light from incandescent sodium vapour have a definite length, but that those emitted by incandescent iron or charcoal have all possible lengths lying between certain limits. The spectroscope, when applied to light from such a source, shows a continuous spectrum, whereas when applied to sodium light it shows the well-known sodium line. It is conceivable that Hertzian rays have a continuous spectrum, and Bose wanted to test this point. The spectrum of a beam of light can be obtained either by means of prisms or by employing a diffraction grating, which usually consists of a plate of speculum metal, on which, by means of a dividing engine, a number of equidistant scratches are ruled with a diamond point, so close together that there are sometimes ten thousand or twenty thousand to the inch. Bose imitated this arrangement on an enlarged scale, suitable to the different magnitude of the length to be measured. Instead of scratches some thousands to the inch, he used metallic strips an inch or so apart, arranged so as to form a concave cylindrical grating, analogous to the concave gratings employed by Rowland for light. No slit was necessary, as the line of discharge of the sparks was sufficiently narrow of itself, and was kept parallel to the strips of the grating. A cylindrical grating focuses the spectrum without the aid of a lens, and when the distances are properly adjusted the various colours are brought to a focus at successive points on the circumference of a certain circle. Professor Bose made his observations by moving his spiral-spring receiver slowly along this circle, and he found that the

effect was only obtained in one definite point on the circle—a fact which indicates that there was not a continuous spectrum, but one definite wave length. In his principal experiment the wave length thus found was 1·48 c.m., which was about double of the nearest distance between the two outside balls. With a larger central ball, and a greater distance between the two outside balls, the wave length was found to be 2·36 c.m. These lengths, one being about $\frac{3}{4}$ in. and the other about 1 in., are gigantic when compared with wave-lengths of light, of which, roughly speaking, it takes 50,000 to make an inch. Another curious effect obtained by Prof. Bose was that yarn wound regularly upon a flat spool of wood acts upon the Hertzian rays in the same way that tourmaline acts upon rays of light, that is to say, it transmits only a portion of the incident radiation, and this transmitted portion is polarised. The polarisation was tested by the usual reflection test.

To the general public the most interesting of recent electrical discoveries is that of the Röntgen rays—rays which, though they do not directly affect the eye, are capable of affecting photographic paper, and also of producing fluorescence in certain substances, especially in platino-cyanides. Unlike rays of light and Hertz rays, they cannot be refracted, and hence cannot be focussed by a lens. The pictures which are obtained by their aid are accordingly not images, but only shadows. Whatever sharpness they may possess is due on the one hand to the smallness of the source from which the rays proceed, and on the other to the nearness of the object to the paper on which its shadow falls. Their chief interest with the public lies in the fact that flesh is very transparent to them, while bone is comparatively opaque, so that the shadow of the skeleton is cast by the living body. Lenard had previously found that when the cathode stream in a Crookes' tube was directed against the side of the tube, some influence, which might be regarded as a continuation of the cathode rays, could be detected outside the tube. This

influence is now known as the "Lenard rays." He found that it could affect a photographic plate, and could also produce fluorescence. Shortly afterwards Röntgen found that along with these "Lenard rays" there were present other rays possessing still more remarkable properties, and to these he gave the name of the X rays, X being adopted as a convenient designation for an unknown quantity. One may be disposed at first to think that the Lenard rays and the X rays are not two things, but one and the same thing investigated by two different people. This, however, would be an erroneous impression. There are two distinct kinds of rays mixed up together. One test for distinguishing them is the influence of a magnet. When lines of magnetic force run across a moveable wire through which a current is passing they make the wire move sideways. The visible discharge in an ordinary Geissler tube is moved in the same way, and so is the cathode stream in a Crookes' tube, and so also is the stream of Lenard rays outside the Crookes' tube; but the stream of X rays is unaffected—the X rays cannot be deflected by a magnet. I may mention, in passing, some particulars which I heard from Prof. Lenard's own lips at the recent meeting of the British Association, and which were new to most of his audience. The Lenard rays, when they have to pass through air at atmospheric pressure, behave very much like rays of light passing through a turbid medium, such as muddy water or a dense fog; but when the pressure is reduced to about $\frac{1}{4}$ of an atmosphere they begin to show a definite track, and the more the pressure is diminished the more definite they become. When you have sufficiently diminished the pressure to obtain a well-defined and narrow stream, it is found, on bringing magnetism to bear upon it, that the stream is not only deflected to one side, that is to say, curved towards one side, but that it is widened out by unequal deflection of its different constituents—an effect precisely analogous to the widening out of a narrow beam of solar light into a spectrum by unequal refrangibility. The interpretation put upon this phenomenon is, that the stream is a stream of

electrified particles travelling with various velocities, and those which travel slowest are most deflected.

But what theory are we to form as to the nature of X rays, and in particular how are we to account for the fact that they do not undergo refraction? Refraction is explained on the wave theory of light as being due to difference of velocity in different media. If the index of refraction in a piece of glass is 1·5, light travels $1\frac{1}{2}$ times as fast in air or vacuum as in this glass. Light of short wave length, such as violet light, is more refracted than red, because the difference between velocity in vacuum and velocity in glass is greatest for the shortest wave lengths. In vacuum long and short waves travel with one and the same velocity. In glass the shortest waves travel slowest. Absence of refraction indicates that if the X rays are a manifestation of wave motion, the waves are propagated with one and the same velocity in all substances. The view which has been almost unanimously adopted by the highest authorities appears at first glance very paradoxical. They maintain that the X rays represent waves of much shorter wave length than those which constitute light. They explain the absence of refraction by the shortness of the wave length, in spite of the fact that in the case of light the shortest waves are the most refracted. This looks like madness, but there is method in it. The most successful attempts that have been made to explain by mechanical analogies the dependence of refrangibility on wave length are discussed by Lord Kelvin in his Baltimore lectures. He works out in detail the suggestion that each particle of matter is to be regarded as having a heavy nucleus in its centre, which is elastically connected with its outside. The waves of ether, which constitute light, are hampered by the presence of the particles of matter between which they have to pass, and, as a result of continually repeated impulses given by the ether to the material particles, the particles are set in forced vibration. These forced vibrations of the particles of matter react upon the ether, and as the result of an elaborate mathematical investigation it comes out that the velocity of propagation of

the waves is modified. The influence of the particles will be greatest when the natural period of vibration of the nucleus (or one of its natural periods, if it have more than one) is nearly or quite the same as the periodic time of the incident waves, and this explains the intensely black absorption bands and other singular phenomena exhibited in the spectra of certain substances, such as fuchsine, phenomena known by the name of "anomalous dispersion." In the case of an ordinary transparent substance the theory tells us that this coincidence would occur at a certain wave length, far beyond the hitherto known ultra violet; but beyond this point the influence of the nucleus will diminish, and for wave lengths within a certain range the influence on velocity of propagation will be practically nil, which means that there will be no refraction. We are familiar in many applications of science with actions which go on increasing up to a certain point, and beyond this point diminish again; and it is claimed that this may be true for refrangibility as dependent on wave length.

Among recent advances I must not omit to mention the brilliant experiments exhibited by Tesla about five years ago. They relate to the modification which takes place in the ordinary discharges in vacuum tubes, when the frequency of alternation is greatly increased. The fullest account I have seen of his results is contained in the "Journal of the Institute of Electrical Engineers," vol. 21, No. 97, issued April, 1892; but several of his experiments have become common property, and you may probably have seen them at conversaziones. He is rather indefinite in his information as to the actual frequency of his alternations, but he speaks of 10,000 per second and 20,000 per second as low frequencies. One remarkable result concerns the physiological effect. It is well known that alternating currents give, as a rule, a severer shock than direct currents; but with the extreme rapidity of alternation employed by Tesla no shock is felt at all. In many of the well-known Tesla experiments the operator allows his own body to form part of the

circuit for the currents which produce the visible luminosity. It would seem that the human organism is not able to vibrate fast enough to respond to such an excitation. This is in accordance with other well-known facts in connection with nervous stimulus. The bobbing of a gas flame is very annoying when it is slow, and increasingly painful when it is a little faster ; but when it is as fast as 100 bobs per second it is not perceived at all. Another noteworthy result is the ability to dispense with conducting communication. It is not necessary to have wires passing through the ends of a vacuum tube, or if such wires are present it is not necessary to connect them with the terminals of the source of electricity. The influence which produces luminosity in the tube is able to make its way through the glass. A large cubic space of air can be filled with the influence by hanging up a large sheet of metal on insulating supports and connecting it with one terminal of the source, while a similar plate connected with the other terminal hangs at the other side of the space. Any vacuum tube held in the intervening space will become luminous. It appears from these experiments that air, or at all events rarefied air, is very easily thrown into such a state of vibration as to become luminous, by an exciting cause which operates by an extremely rapid succession of impulses—that, in fact, very little energy is required to produce light if we can only find the means of applying our energy in the right way. Other facts may be quoted confirming the same view. Every one must have seen the phosphorescence of fish lying on a shelf in a dark pantry, and many of us have seen beautiful displays of phosphorescence on the surface of the sea—due, I believe, to a small animal called the *noctiluca*. I have scooped up phosphorescent water from Kingstown harbour, and seen the little bright objects with which it abounded. The glowworm is well known by name, though many people have never seen it. I have seen it once or twice in England and taken it in my hand, its light continuing all the time to be emitted. It was a wingless beetle, about an inch long. Much more vivid is the light of the firefly, which I have seen on

summer evenings in Nova Scotia. Its flashes suddenly appearing and as suddenly disappearing in mid-air are quite startling. I caught one, and should describe it as a flying beetle or cockchafer, the luminous part being under the wings, so as to be sometimes covered and sometimes exposed. The appearance which it presents when on active duty is very similar to the sudden striking of a match. In these cases there seems to be very little energy available for producing the observed luminosity, and the same remark applies to the phosphorescence of several well-known salts of calcium and of strontium, which, after being once exposed to the sun, remain self-luminous when seen in a dark room for months or even years afterwards. There is a shrewd suspicion in many minds that our present methods of producing artificial light are excessively wasteful —that we produce an enormous quantity of heat, of which only a small part is utilised as light.

In connection with all our progress in the theoretical knowledge of electricity and of the closely allied subject of light, the question of the nature and constitution of what we have been accustomed to call the luminiferous ether is becoming increasingly prominent. We can no longer afford to regard it as a mere working hypothesis, a fiction of the imagination, or a thing of doubtful reality—a mere ghost; for we are giving it more and more work to do, and all our philosophy breaks down without it. But it is in many ways a puzzle. It allows all sorts of bodies to move through it without any sign of resistance, and yet it serves for the propagation of transverse vibrations—a property characteristic of a solid, as distinguished from a liquid or a gas. The nearest approach to it in ordinary substances is a jelly. A jelly possesses the right kind of elastic properties; but bodies cannot move through a jelly without very considerable resistance, and it is not self-healing when ruptured by their passage.

Modern mathematicians would like to reduce all nature to a frictionless, incompressible fluid, possessing certain internal motions—eddies, vortices, and so forth, which in

virtue of known properties, directly deducible from Newton's three laws of motion, and roughly illustrated by smoke-rings, spinning tops, and gyrostats, will, when properly looped together and interlaced, give us a variety of structures corresponding to the different kinds of matter. One of the latest and most elaborate attempts to devise a structure for the ether has been recently published in the Phil. Trans. by our fellow townsman, Professor Larmor, under the title "A dynamical theory of the electric and luminiferous medium." Much yet remains to be done before anv such theory can be said to be established, or even to have met with very wide acceptance.

PROFESSOR REDFERN, in moving a vote of thanks to the lecturer, expressed regret at Professor Everett's withdrawal from the Queen's College, and hoped that it would not mean his withdrawal from the neighbourhood of Belfast.

Mr. J. BROWN seconded. He remarked that the discovery of the Röntgen rays, though "made in Germany," had very narrowly missed being made in Ireland, Professor George FitzGerald, of Dublin, brother of their ex-president, having twelve years ago expressed the belief that, under certain conditions, the effect could be obtained.

The vote of thanks was passed unanimously.

PROFESSOR EVERETT having replied,

The proceedings then terminated.

1st December, 1896.

PROFESSOR J. D. EVERETT, F.R.S., D.C.L., in the Chair.

REPORT OF MR. A. TATE, M.I.C.E.,
Delegate to Conference of British Association, 1896.

MR. ALEXANDER TATE first submitted his report of some matters which were considered at the meetings in Liverpool. He asked the special attention of the Society to two schemes affecting the working of societies like theirs which were discussed at considerable length at those meetings. The object of the first of those schemes was to promote the formation of district unions of natural history societies. It was drawn up and submitted by Mr. George Abbott, General Secretary of the South-Eastern Union of Scientific Societies, and it proposed the division of the United Kingdom into fifteen or twenty districts, in each of which the societies should be grouped together for mutual aid, counsel, and work, any existing unions to be taken advantage of and not disturbed, each union to have an annual congress, held year by year in different towns, and to be attended by delegates and members from the affiliated societies. A further suggestion was that each local society should have a corresponding member in each village in its district to look after its interests and forward in every way its objects. The working of the Yorkshire Naturalists' Union had been very successful, one important result being the training of a number of skilful workers in the various departments of natural science. What had been done in regard to the Irish Union of Natural History Societies was clearly stated by Professor Johnston, the delegate from Dublin Natural History Society, and was corrobo-

rated by himself (Mr. Tate). The second proposal was made by Professor Petrie, its object being to provide a federal staff for local museums. He alleged that the main difficulty in the management of local museums was the securing of sufficient work for and means of paying for services of highly-trained and competent men as curators, and he considered that this would be obviated if there was co-operation. The opinion of speakers who took part in the discussion was generally favourable to the scheme. It appeared that a somewhat similar idea had been mooted some years previously, and had been reported on by a sub-committee of the Museums Association, without, however, leading to any definite result. A strong protest was made by Professor Johnston, of Dublin, against the suggestion that the curators of the local museums should be converted into mere caretakers, and referred in terms of high commendation to the abilities of a curator in the North of Ireland.

The PRESIDENT was sure they were all very much indebted to Mr. Tate for the manner in which he had represented their Society at the conference.

Mr. W. H. PATTERSON, M.R.I.A., read a Paper entitled—

"A RECENT DISCOVERY OF WORKED FLINTS IN SUBMERGED PEAT AT PORTRUSH."

MR. W. H. PATTERSON, M.R.I.A., then read the following account of a recent discovery of worked flints in submerged peat at Portrush. He explained that the West Bay at Portrush had long been known as the site of an exposure of submerged peat. The winter storms of the last two years had, by washing away great quantities of sand, caused a much larger section of peat to be visible. The thickest masses of peat were at high-water mark, in one place forming a perpendicular face of nearly six feet high. In other places the peat showed an exposed face of three or four feet, and from that down to one foot or less,

according to the extent to which the sea carried away the shelving sand which sloped from the peat down to the sea. There was also a good exposure of the peat and numerous remains of large trees between tide marks. Here one walked on the top of the deposited beds, which were probably thinned away by marine denudation. The beds of compact peat higher up on the beach which present faces of various heights, as referred to before, were overlaid by banks of sand from fifteen to twenty feet high, with vegetation on their surface. The sand was fine, and seemed to be chiefly blown, but in some places a slight stratification showing pebbles was noticed. This sand had been deposited over the peat, but was now being removed by the action of the winds and waves. The peat was exceedingly compact, but contained sand, showing that it was formed within the influence of winds carrying sand, doubtless from some sea strand. The peat could not possibly have been formed at its present level as regards sea; the land here had probably experienced a downthrow, or possibly alterations of level had taken place, and thus the sea had been enabled to encroach very considerably upon the land. The remains of the forest of large fir trees between tide water-marks at a level where such trees could not be grown made the matter of the downthrow very evident. In many places around our shores submerged peat with tree remains was found. On the occasion of a visit to Portrush in April, 1896, he was examining the exposed sections of peat at the West Bay, when he noticed the point of a piece of flint projecting from the weathered face, and on pulling this out it proved to be a well-formed flint flake. A little examination with the blade of a knife showed that there were more flakes behind the one first noticed, and the result was that in two visits he collected about eighty flakes, about twelve cores, and a considerable quantity of chips, but no axes, scraps, nor any examples showing secondary workmanship. With the exception of two or three outliers the flints were confined to an area of not more than two feet square. They formed a flattened heap; they rested on peat, and were overlaid by about one foot of

exceedingly compact peat, and this in turn had been covered by about 20 feet of sand, now partially removed by sea action. The flints were firmly packed together ; in fact, they were interlocked with one another, so that when working into the face it was sometimes difficult to get one out until the adjoining ones had been loosened and dislodged. The whole find was evidently the heap which the old flintworker had formed at his feet while he sat at his work on the hard surface of the ground before some of the changes of level took place, which enabled a later growth of peat to come and cover up the surface, including the heap of flints. The flints were quite unweathered and unrolled, and had their edges as sharp as if they had been just made. Their colour was quite unchanged, being the same dull black or dark grey that freshly-broken flint presented. Many of the flakes were of exceptionally large size, with great heavy butts, while others were thin and delicately formed, reminding one of the modern gun-flint makers' flakes. The cores also resembled those from which modern flakes were struck. On the whole, the flakes and cores were much like those found in the Larne gravels, with the marked difference that instead of being rolled and weathered they were perfectly sharp and fresh. The flakes measured from one inch to five inches long, most of them, however, being about three inches. He noticed that some of those flints were marked with spots or splashes of a clear vitreous glaze, exceedingly thin and transparent, as if liquid glass had been dropped or splashed upon them. This glaze reflected the light, but seemed to be without any appreciable thickness. He presumed that silica in solution must have come in contact with some of the surfaces of the embedded flints, but further than this he could suggest no explanation of the matter.

Dr. Lindsay subsequently read an essay on "Dante," which was warmly praised by the President and other members.

Mr. R. M. Young, J.P., M.R.I.A. (Hon Secretary), read the following letter which he had received from the Marquis of

Dufferin and Ava, from whom, he added, they hoped to have the pleasure of a paper next year :—

"Clandeboye, County Down,
November 6th, 1896.

"SIR,—I beg to acknowledge the receipt of your communication of the 4th November, and I would ask you to be good enough to convey to the Council of the Belfast Natural History and Philosophical Society the expression of my thanks for the honour they have conferred upon me in electing me an honorary member of the body they represent. It is a compliment which I very much appreciate.—Believe me, yours sincerely,

"DUFFERIN AND AVA."

This concluded the proceedings.

5th January, 1897.

PROFESSOR J. D. EVERETT, F.R.S., D.C.L., in the Chair.

Mr. L. L. MACASSEY, Barrister-at-Law, M.INST.C.E., read a Paper entitled—

"A RUN THROUGH THE MOURNE MOUNTAINS."

THE CHAIRMAN having briefly introduced the lecturer,

Mr. MACASSEY then proceeded with his paper, in the course of which he said that when the Secretary of the Society asked him some little time ago to read a paper he felt great difficulty in giving an answer. The secretary had suggested that he should take up the subject of the Mourne district, because it had a special interest to residents and ratepayers in Belfast. The Mourne country possessed very fine natural features, and the district had been selected by the water authority in Belfast as the source of the future water supply for the city and district. For these two reasons he had given his lecture the title it bore. The lecturer then referred at length to the scenery of the various interesting points of the Mourne district, his remarks being illustrated by a number of fine lantern slides from original photographs taken by Mr. R. Welch. A word of praise was given to the manager and officials of the County Down Railway Company for the excellent and comfortable train service the public enjoyed on their line. Views were shown along the coast road from Newcastle past Bloody Bridge and towards the water shed the Mourne drainage scheme is designed to tap. Mr. Macassey also described at length the Silent or Happy Valley, which will be used as an immense natural reservoir for storing the water from the surrounding country, and said when

completed the lake thus formed would be one of the most lovely spots in Ireland, and even unsurpassed by the scenery of the lake district of Cumberland.

On the motion of Dr. REDFERN, seconded by Mr. WILLIAM GRAY, a cordial vote of thanks was passed with acclamation to the lecturer, and

The proceedings terminated.

9th February, 1897.

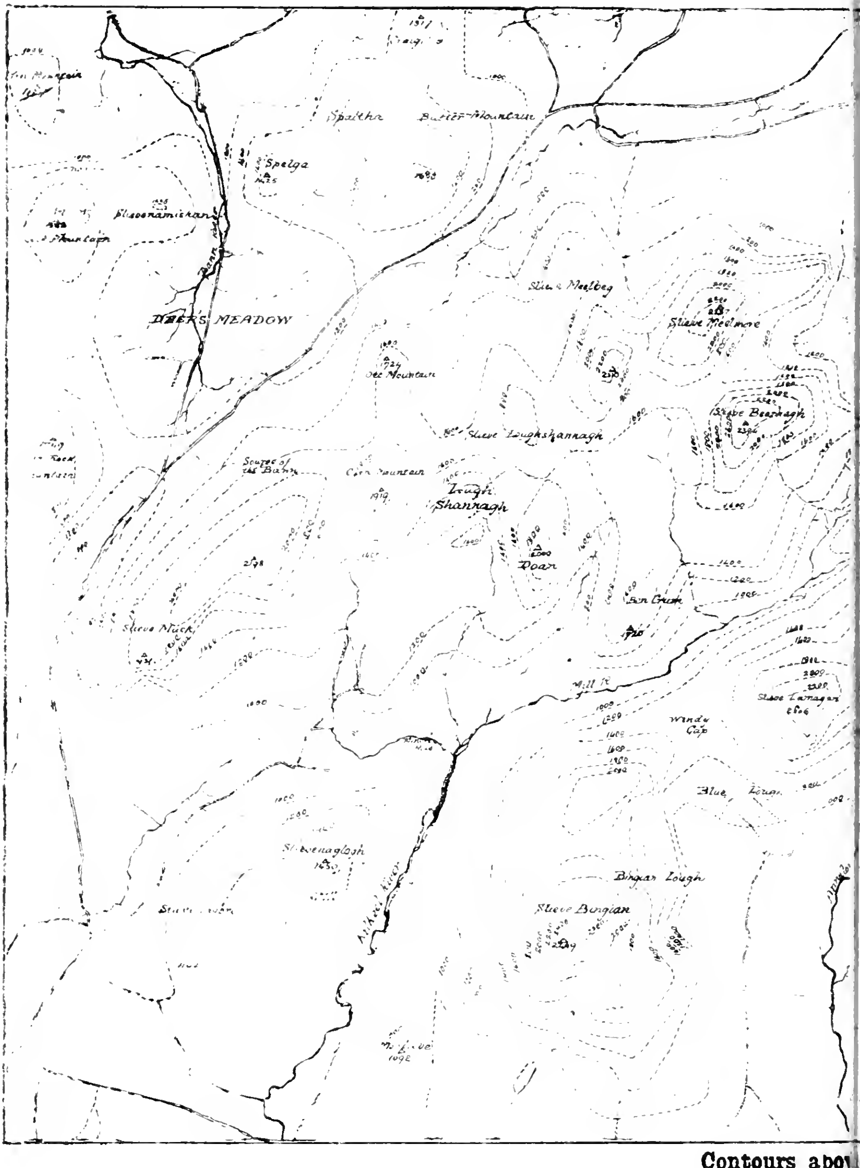
PROFESSOR J. D. EVERETT, F.R.S., D.C.L., in the Chair.

MR. HERMANN WALTER, M.A., PH.D., read a Paper entitled—

"THE MYSTERY OF INDIAN FAKIRISM."

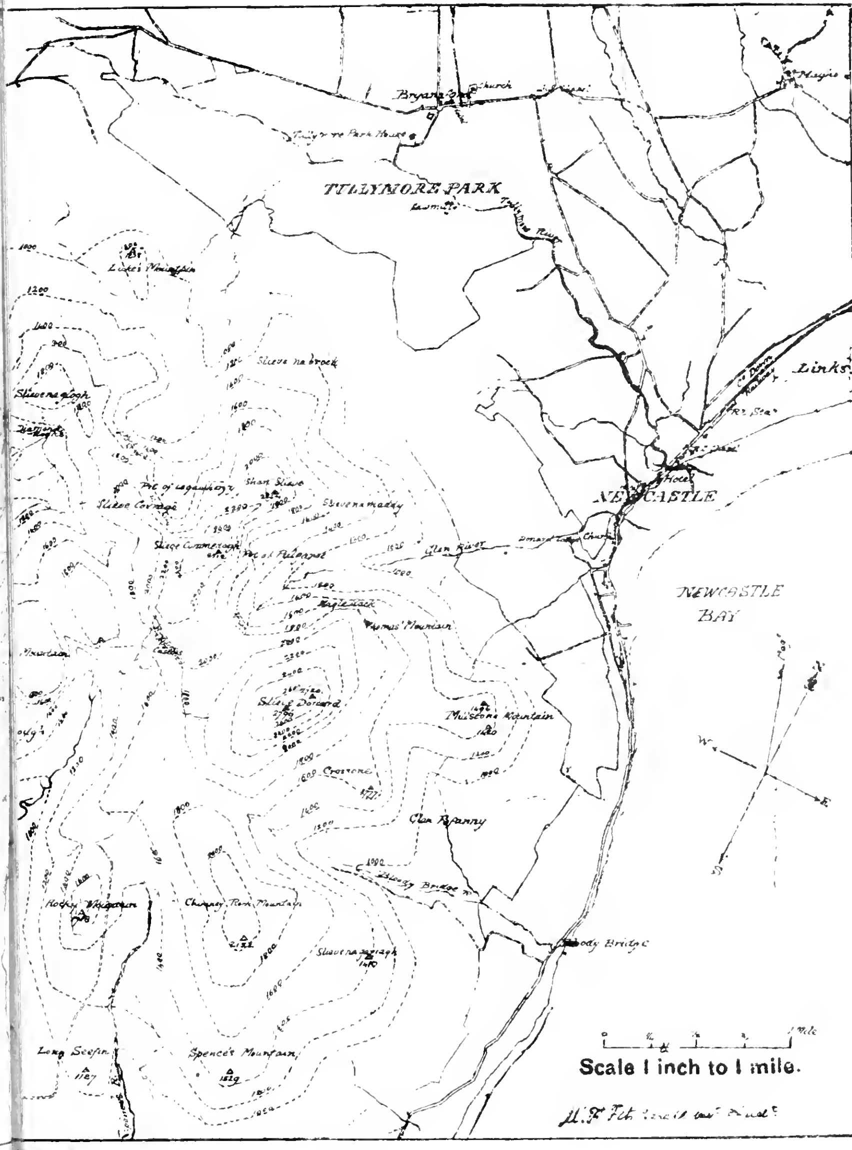
THE CHAIRMAN, in introducing him, said Mr. Hermann Walter, who had recently come to Belfast, was an acquisition to Belfast literary society. He was a distinguished linguist, and had made a close study of the subject of which he would speak to them that evening.

The lecturer prefaced his paper by stating that the Indian Fakirs, or Yogins, were every now and then attracting unmerited attention, chiefly owing to the efforts of theosophists, who were the European relatives of the Indian Yogins. These Yogins were Pantheists, believing in the doctrines of the transmigration of souls and the law of Karma, and holding that the only possibility of salvation lay in the identification with Brahma, the only true existence. This Brahma was a purely philosophical conception, and not in any way connected with Brahma of the Hindu Triads. The identification with Brahma could only be brought about by concentration of the mind on the fundamental doctrine of their system—that there is only one true existence, and that all individual existence is illusory. To facilitate this concentration the Yogins have invented an elaborate system of physical training; everything tending to bring about a cataleptic state. Instances were given of the postures in which the aspirant would have to remain motionless for days and weeks. In connection with the practice of res-



Contours abo

Newcastl



000 feet over Ordnance Datum.

trict of Mourne Mountains.

training the breath, the lecturer rèferred to the erroneous anatomical and physiological notions of the Hindoos in general and the Yogins in particular—notions on which the whole of their system was based. The object of the various practices seemed to be to concentrate the breath at a mysterious spot at the crown of the head corresponding to the anterior fontanelle, but by these practices the Yogin was supposed to acquire also various superhuman faculties. When the aspirant has thus carefully trained himself he may proceed to the concentration of his mind on different mystic sounds, and he will then attain what he imagines to be the final salvation, but what is really nothing more than a cataleptic state. The lecturer concluded by pointing to the probability of these phenomena being of a hypnotic character.

The hearty thanks ot the audience were accorded to Mr. Walter, on the motion of Dr. SHELDON, seconded by Professor PURSER.

Professor FITZGERALD, B.A., A.M.I.C.E. (Queen's College), followed with a Paper under the title of "Contouring with Barometer in Mourne Mountains," which was illustrated by diagrams and maps. The learned professor has made a careful investigation of this most attractive portion of County Down, and the results of his survey of the mountains had a special significance on account of the fact that it is from the many springs in which they abound that Belfast will for generations to come derive its water supply.

2nd March, 1897.

PROFESSOR J. D. EVERETT, F.R.S., D.C.L., in the Chair.

MR. SEATON F. MILLIGAN, M.R.I.A., read a Paper on

"IRELAND: ITS ANCIENT CIVILISATION AND SOCIAL CUSTOMS."

MR. MILLIGAN said—The subject on which I will address you is of great interest, from the fact that Ireland was the only country in Western Europe whose civilisation was uninfluenced by the great Roman Empire. It retained the ancient laws and customs of the Celtic race unimpaired, when Britain, Gaul, and Central Europe had accepted Roman laws and customs. In Ireland only were the ancient laws and customs of the Celt preserved pure without foreign mixture. The Brehon laws, as they are called, remained in force, and were the only laws which Irishmen recognised in a great portion of this country up to the beginning of the 17th century. It is by studying the Irish language and Brehon laws we can form a correct view of the social condition, modes of thought, and civilisation of the inhabitants of Western Europe before the rise of the Roman power. A Scot of Ireland in Pagan and early Christian times could make himself understood in his own language through Britain and Gaul. This country was known to the ancient Greeks in the earliest period as the country of the hyperboreans (the Romans called it Hibernia), but the natives Scota, and the people were called Scots. It was also called Eire, Erin, Innisfail, and Banba, and now for many centuries past Ireland. It has beautiful and diversified scenery,

a sinuose coast line, pierced by bays and fjords; its lakes, rivers, mountains, glens, all contribute to make it one of the most charming countries in Europe. Those who possess an antiquarian turn of mind have a great choice of ancient monuments, including round towers, Celtic churches, beehive huts, and other vestiges of an early Christian period. The monuments of pre-Christian times, duns, raths, and cashels, which were the homesteads and stronghold of the Celtic people, that remain as landmarks in every corner of the island. indicative of the large population that once resided in it. Ireland is the most western part of Europe, a fragment of a great continent that in pre-glacial times stretched westward for several hundreds of miles, which the poetic imagination of the Celt still points to as the fairyland, Tyrnanoge, which may be seen sometimes beneath the waters of the western ocean as the sun sinks beneath its surface. The brilliant green of its fields in summer, and the purple of its heath-clad hills in autumn, have a charm for all who are lovers of the beautiful in nature. I shall only have time to skim the surface of a subject brimful of interest. It is gratifying to know that an effort is being made to revive the ancient language and music of Ireland, which for the past century and more have been slowly dying out. Scholars who are competent to torm a correct opinion state that it is most important that Irish should be preserved, that it is in some respects more interesting than either Greek or Latin, and probably an older member of the Aryan group than either. In addition to the great store of Celtic manuscripts, we have a collection of antiquities in the Royal Irish Academy that illustrates our ancient civilisation from the most remote times. Ireland is now a comparatively poor country, but it would seem to have been a rich country in the early ages, if we take into account the great variety of ancient gold ornaments that still remain. No other country in Europe possesses a tithe of the ancient gold ornaments that Ireland has, dating back to the most remote times. The exquisite workmanship displayed on the very oldest of these is a proof of a very high order of artistic skill of ancient

Ireland. The personal ornaments, such as torques, lunalae, and fibula, exhibit most intricate and exquisite workmanship and ornamentation of a very high order of merit. The later metal work from the tenth to the twelfth centuries, such as croziers, shrines, book-covers, crucifixes, and vessels, such as the Ardagh chalice, show that Irish artists, before they came in contact with the Anglo-Norman, were able to produce work of rare excellence. Irishmen excelled all competitors in the art of illuminating vellum manuscripts. Dating from the middle of the 6th century onwards we have a collection of these manuscripts that no other country in Europe can equal either in antiquity or workmanship. The initial letters in the Book of Kells are exquisite works of art. This manuscript is a copy of the Gospels which belonged to the Monastery of Kells, County Meath, supposed to have been written in the 8th Century. It fell into the hands of Primate Ussher, whose library was acquired by Trinity College, where it is now kept. The book of Durrow, which belonged to Durrow in the Queen's County, is another fine manuscript. So highly were the Irish scribes thought of that the Eric, or penalty for killing a scribe, was the same as for an abbot or a bishop. We will refer to our subject under four periods—viz., the Pagan, early Christian, Anglo-Norman, and modern. The oldest records do not refer to the people who made the rude stone implements, and who cremated their dead. The theory commonly accepted is, that not alone Ireland, but the entire of Western Europe, was at one time peopled by a small-sized Iberian race, whose present representatives are the Lapps and Finns. It is supposed that the underground caves, so well known as souterraines, may have been dwelling places of this race, as only men considerably less in stature than Irishmen of to-day could stand upright in them. They were not agriculturists, but hunters and fishers; they used flint and stone implements, probably cremated their dead, and they may have been the first to raise Cromleachs. There is no reference in our annals to cremation, though cinerary urns and calcined

human bones are frequently found in every part of Ireland; nor is there any reference to the bow and arrow until the 5th century, though such large quantities of flint arrow heads and spear heads are found. The shooting of Niall of the Hostages by a Leinster Prince with an arrow on the banks of the Loire is the first reference to this weapon in Irish history. The Fribolg and Danaan tribes succeeded the men of the Stone Age; they built raths, duns, and cashels, in which stood their wattled huts. They were a pastoral people mainly, and probably tilled the soil a little. Their weapons were bronze, and are accurately described in the annals. The Danaans were the more skilled, had better and sharper weapons than the Fribolgs, whom they conquered. They are supposed to have come from North Europe or Scandanavia. The Milesian race came from the south; their ornaments were Egyptian in character, both in shape and ornament. It is said they came from Spain, where they would have been in touch with North Africa and Egyptian influence. The religion of these tribes was Druidical; they worshipped the sun, moon, and stars, and the forces of nature, as the wind and lightning. They had groves on the hills sacred to Baal; their brehons, or judges, held their courts in the open air in the eye of the sun, where it was supposed no magic spell could influence their judgments. The Danes did not reach Ireland till the 8th century, and the Anglo-Normans in the 12th century, and the Irish of to-day are the descendants of all these various races. We do not include the Scots of the plantation, as they were our own kith and kin, who emigrated to Scotland in the 5th, and returned to the old land again in the 17th century. It may be interesting to inquire as to what stage of civilisation was attained in Ireland before the introduction of Christianity. A number of families closely related or descended from a common ancestor formed a tribe or clan, which was ruled over by a chief. The clans occupying a large territory, equivalent to a province, owed allegiance to a higher chief, or Provincial King. There were five of these kings, one of whom was elected Ardrigh, or High King. The Provincial

King was supreme in his own territory, and the chief had the power of life and death in the clan. The relative duties of the Provincial Kings to the Ardrigh, and his relation to them, are clearly set forth in a book called the "Book of Rights." The tributes paid to the Ardrigh by the Provincial Kings consisted of mantles, swords, spears, shields, cattle, hogs, cauldrons, and also certain entertainments when making a royal progress through the kingdom. The grades of society beneath the kings and chiefs depended on the ownership of land in fee, or the tenancy of land and the number of cattle a man owned. The owner in fee of land who paid no rent, be his property either large or small, had the rank of Flaith, equivalent to a noble. The other grades paid rent to this order. Rent-paying farmers were divided into a great many grades or classes, regulated by the extent of the holding and the numbers of their flocks and herds. They were called Celies, some of whom, like the middlemen of recent times, rented large tracts and sub-let at a profit to those below them. The lower class of farmers had special designations depending on the number of cattle they owned. Below these were the free labourers, and next the bond-men, or slaves, who received no wages, and were usually captives taken in war or on plundering expeditions. Of the learned classes, Druids, poets, and brehons, there were seven grades, and their services were paid for by grants of land and special gifts. The greater chiefs and kings have hereditary bards, who recorded their genealogy and history. The ranks of men in those days were distinguished by the number of the colours in their garments, the greatest number—seven—were worn by kings. The Royal Stuart Tartan has seven colours, which had its origin in this way. Before a new law was promulgated it was read before an assembly of all ranks, and had to be approved of by a majority. As already mentioned, the form of religion was what we know as Druidical. At midsummer fires were lighted on the hills, and a varied ceremonial was gone through in honour of the sun god. The worship of wells also was another Pagan cult, which has survived to modern times.

The Brehon laws are most voluminous, and cover every possible crime, to which adequate punishment was awarded. The duties of the various classes of society, from the head king downward, towards each other were clearly defined. There were laws regulating the military system and defence of the country. Laws dealing with engagements and bargains, and relating to property entrusted or given in charge to others ; laws dealing with gifts, presents, and alms ; of loans, pledges, and securities; laws stipulating the fees of doctors, lawyers, teachers, and judges, and all other professional people ; laws dealing with trades, such as weaving, spinning, building, and brewing ; laws relating to fosterage, and the relative duties of parents and children, of foster fathers and foster mothers, including details respecting the training, food, and clothing of all children, from the King down. A very complicated, yet clearly defined, series of laws regarding landlords and tenants, master and servant, explaining the various classes of lords, and of masters, and of servants, and of tenants, and the origin and termination of tenancy and service. They had schools, and orders of learned men equivalent to our collegiate degrees, in addition to teaching the youth they recorded historical events, and preserved the genealogies. They taught the whole course of Gaelic literature in prose and verse. The sons of the nobility, in addition to literature, were taught horsemanship, chess, swimming, the use of arms, chiefly casting the spear. Their daughters were taught sewing, cutting, and embroidery. The sons of the farming classes were taught the same as the nobles, excepting horsemanship. When enumerating a few of the ancient Brehon laws, I omitted one regarding a free pass around the sea coast of Ireland. This law states—"That the space of the cast of a dart from high-water mark towards the land shall be left for a road, which may be enclosed in by a bank, one next the land, and the other next the sea." If the Brehon laws were still in force in Ireland such an action as that pending about the Causeway could not be brought. Several Irish customs are similar to those of ancient Greece. Certain families in both had cures for certain diseases, the receipt for

which was handed down from father to son. The Olympian games had their counterpart in Ireland at Telltown. The aenachs or fairs were held annually, and sometimes triennially. The games consisted of horse and chariot races, running and wrestling, athletic games, and musical festivals. Christianity was introduced into Ireland in the middle of the fifth century, but it is generally believed some slight knowledge existed of it before that time. There was a Celtic Church in Britain long before this, that the Irish must have known somewhat of. The mission of Saint Patrick is well known, and his success in christianising Ireland. His knowledge of the language and the habits of the people, which he had acquired in captivity, eminently fitted him for this mission. The Pagan laws which had been in force up to the time of Patrick naturally clashed with the more benign spirit of Christianity. Through the influence of Saint Patrick they were modified and altered by a committee appointed for that purpose, and had afterwards to be ratified by a national convention, in which all classes were represented. This was done, and the laws thus amended remained in force to the beginning of the seventeenth century. Saint Patrick was followed by Columba, who converted the Picts of Scotland. Columbanus followed next. He was educated under St. Molaise, in the island of Devenish, Lough Erne; afterwards he came to our own locality, to the great school of Bangor, and after remaining here for a length of time he decided on going as a missionary to the Continent. When he left Bangor, towards the end of the sixth century, he brought with him several brethren, amongst whom was Gaulus, known afterwards as Saint Gall, who founded a monastery in Switzerland, and the town of that name still records the name of the Irishman who over 1,200 years ago founded its monastery. Columbanus and his Irish monks preached through Burgundy, went up the Rhine in coracles to Switzerland, crossed over into Lombardy, and founded a school and monastery in North Italy, at Bobbio. This monastery remained all through the ages up to the year 1803, when it was suppressed by Napoleon on his invasion of

Italy. To this monastery the Irish monks brought from Bangor a manuscript containing the Liturgy of the ancient Irish Church, which has been translated in recent years. The ancient monastic schools perpetuated the teaching of the older Bardic schools, with this difference—that Christian ethics were taught instead of Pagan. Some instances were given of how exceedingly careful were some of the ancient Irish teachers of the strict observance of Sunday, in which all manual labour was totally avoided. The first great breach in the progress of civilisation in Ireland was the invasion of the Danes. They arrived first in the year 795, first coming as maurauders, and returning with their plunder. They next came to remain and take possession of the country. It was at this period the round towers were built, as places of refuge, as the churches and monasteries were the first places the Danish invaders attacked, being possessed of the greatest wealth and the least power of resistance. The Danes largely influenced Irish affairs ; they were great sailors and traders, as well as pirates. The founded all the Irish towns, as Dublin, Wexford, Waterford, Cork, Limerick, Carlingford, and others. The Irish were a pastoral people, living in the country, tending their flocks and herds, so that the founding of trading stations around the coast was a great innovation on the old system. The Danes became Christianised, and though finally beaten at Clontarf, they did not wholly leave Ireland, but many remained and inter-married with the natives, so that the Irish to-day are the descendants of the various races referred to, as well as of the Anglo-Normans who came later. When the Normans came they built strong castles to defend their territory. The Irish preferred the wooded fastnesses of the country, and it was a long time before they erected stone castles. The Anglo-Normans brought over English monks, who built the Franciscan and Cistercian monasteries and the Dominican friaries. The old Celtic monasteries gradually disappeared, as Irishmen were thought to be too favourable to the Irish cause and native Princes. When the monasteries were suppressed by Henry VIII. a great blow was given to learning and culture, as the

monks were schoolmasters and model farmers of the period, and were centres of civilisation in their various localities. Nothing was done to supply the want caused by this act, which was an immense loss to the country. The Bardic schools were few and far between, and no system of national education existed. What a change this was from the earlier period, when the Irish schools were crowded with pupils. The condition of Ireland was referred to at the close of the Elizabethan wars and the decadence in the social condition of the people. The houses of the best people in the reign of Elizabeth were generally one storey and thatched ; the floors, if they had any covering, were strewed with rushes. The Irish chiefs imported Spanish wines in exchange for wool and hides, drank heavily, and usually lived in rude plenty. The first reference to usquebagh, or whisky, is in the year 1405 ; tobacco had been only recently introduced. Men used their skeans or daggers for cutting their meat, and there were no forks. Potatoes were not in common use. Milk, flesh, bread, and butter were the staple articles of diet. The peasantry usually took only two meals in the day ; they were a hardy race, could work or fight for a long time on very scanty allowance. Watercress was a favourite vegetable. The young Irish nobility were allowed to run barefooted up to fifteen or sixteen years of age to make them hardy, and were usually reared by foster-parents. The Lord Deputy generally held hostages of all the great Irish families as a guarantee of their obedience. The usual decoration over the gate of Dublin Castle in Elizabeth's reign was a row of heads of the Irish nobility stuck on spikes, just as scarecrows are put up now to warn maurauding rooks. The face of Ulster was totally different from what it is now ; it was then densely covered with natural forests, through which paths were cut as roads. The few towns were all walled, with a deep trench or fosse filled with water all round, and were usually held for the English. The little town of Killmallock, in the south of County Limerick, is still a good example of an Elizabethan town. One of the town gates still remains, as well as a considerable portion of the

wall and fosse. It was the residence of the President of Munster, and a place of importance 300 years ago. The following is an English writer's description of the dress of the Irish at this time:—"They generally go bareheaded, save when they wear a headpiece, having a long head of hair with curled glibs, which they highly value, and take it heinously if one twitch or pull them. They wear linen shirts, very large, with wide sleeves down to their knees, which they usually dye with saffron. They have woollen jackets, but very short; plain breeches close to their thighs, and over these they cast their mantles, fringed with an agreeable mixture of colours, in which they wrap themselves up and sleep on the bare ground. Such, also, do the women cast over the garment, which covers down to their ankles, and they load their heads, rather than adorn them, with several ells of fine linen rolled up in wreaths, as they do their necks with necklaces, and their arms with bracelets." An English writer in 1566 gives the following account of the arms of the Irish in his day—"Their armies consist of horsemen and of veteran soldiers reserved for the rear, whom they call gallowglasses, and who fight with sharp hatchets; and of light armed foot they call Kernes, armed with darts and daggers. They use the bagpipes in their wars instead of a trumpet; they carry amulets about them, and repeat short prayers, and when they engage they shout their warcry as loud as possible." There is a very interesting account of a journey into Lecale, County Down, by a Captain Bodely, an officer of Queen Elizabeth, in the second volume of the old Ulster journal of Archæology, commencing at page 73, from which extracts were read. Sir Richard Morrison, an English officer, residing in Downpatrick, invited his brother officers who were at Armagh, to spend a few days with him. Bodely, who is rather a humorous writer, gives a very minute sketch of the journey, which illustrates very clearly the customs of the times. They rode to Newry, thence through the wild mountains, where they lost their way, until they came to Magennis's Island, which was a Crannoge stronghold near Castlewellan. Lady Sarah, the wife of

Magennis, who was a daughter of the Earl of Tyrone, entertained them. They describe her as a very beautiful woman, and they all duly kissed her when leaving. They proceeded to Downpatrick, and Bodely describes their supper, drink, bedroom, their dinner next day, and all the small details that add such interest to a story of 300 years ago. Reference was next made to the state of Irish society about 100 years ago. Jonah Barrington has left some interesting details of the customs of his own times. Speaking about the year 1788, and how the gentry occupied their time, he says they were principally occupied with hunting, but when the ground got hard from continuous frost, and hunting had to be stopped, various modes of killing time were adopted, of which I give the following :—"A lodge near the kennel of his father's hounds was occupied by an old huntsman, his wife, and nephew, who was whipper-in. To this lodge his brother sent a hogshead of superior claret; a fat cow was killed, skinned, and hung up by the heels. All the windows were closed to exclude the light. One room was filled with straw and numerous blankets, destined for a common bedroom; another was laid off for a kitchen for the use of the servants. Claret, cold, mulled, or buttered was to be the beverage for the whole company. In addition to the cow, already mentioned, chickens, bacon, and bread were the only viands admitted. Two pipers and a fiddler were engaged to attend and enliven the banquet, which was to continue till all the viands were consumed. A number of leading sportsmen were invited, when the festivities commenced, and extended over several days. When they had eaten and drunk to excess they tumbled into the straw, and were covered by a servant with a blanket. When the last drop of claret was finished and the cow reduced to a skeleton, and all the other eatables had vanished, only then did the festivities terminate. The intervals between the meals were enlivened by cock-fighting, and the whole was wound up with a dance, to which all the boys and girls of the neighbourhood were invited. It was by gross and extravagant living of this sort that the Irish landlords, in the good old times, got

into debt and managed to get rid of their estates. Three classes of gentlemen, who were known under the following titles, were described, viz. :—Half-mounted gentlemen, second, gentlemen every inch, and third, gentlemen to the backbone. A description by Barrington was given of Donnybrook Fair as it was in his day. He says :—Toys and trinkets were on sale in great variety, and in the evening, when the parents had given the children a glass each of the 'cratur,' to keep the cowld out of their little stomachs, every trinket, or drum, fiddle, whistle, or pop-gun, which the fond mothers had bestowed, was set sounding, all together, over the green, and chimed in with a dozen of fiddles and as many pipers, jigging away for the dance—an amalgamation of sounds among the most extraordinary that ever tickled the ear of a musician. Everybody, drunk or sober, took a share in the long dance, and I have seen a row of a hundred couple labouring at their jig steps till they fell off actually breathless, and rather better than if they had been river deities of the Donnybrook." These fairs were the modern survival of what was once a semi-religious festival of the great aenachs, or ancient games. Owing to the amount of drinking that was indulged in, the clergy of all denominations used their influence to suppress them, so that they are now almost extinct. I recollect a fair of this kind held in the County Tyrone up to about forty-five years ago. A similar fair was held at the Giant's Causeway up to about 1849 or 1850; tents were spread on the face of the hill where the hotels now stand; refreshments were on sale, fiddlers and pipers supplied the music, people flocked from far and near, and this continued for a couple of days. Boys strolled over the Causeway enjoying the fresh sea breezes, accompanied by their sweethearts. These annual fairs were looked forward to as the great social event of the year, and greatly stimulated the marriage market. The costume of the country people in the North of Ireland in my earliest days was, for men, swallow-tail coats, knee breeches, long woollen stockings, and laced shoes. The hat was felt, made in the neighbouring town; it was high-crowned, narrow leaf, and heavy, made from lamb's wool, and was useful in

protecting the head from the blow of a stick, which was then a common form of amusement. The women wore large cloaks for an outer garment. A great portion of the cloth used in the family was home-made, and the tailor was brought to the house to make it up. I remember one old man who wore a queue—viz., his hair plaited in a long tail and tied with a black ribbon. The blue cloaks, knee breeches, and home-made hats have disappeared from the North of Ireland, but in County Kerry, near Dingle, a few years ago, I saw men and women apparelled in the old style. The blue cloaks are still worn in the south of County Cork, and also in County Waterford. Englishmen have blundered in the past when legislating for Ireland from utter want of knowledge of its people. Under the more benign influence of recent legislation many of the old grievances have been redressed, so that it is now possible for those who choose to live happy and prosperous in their own little island, where there is ample room for many years to come for all who may remain.

At the conclusion of Mr. Milligan's lecture a large number of interesting lantern slides were exhibited descriptive of Irish antiquities, ancient weapons, churches and monasteries, taken in various parts of Ireland. Amongst the views were many pictures of the Irish peasantry, which were much enjoyed by those present.

Mr. JOSEPH WRIGHT, F.G.S., read a Paper entitled—

"BOULDER CLAY—A MARINE DEPOSIT, WITH SPECIAL REFERENCE TO THE 'TILL' OF SCOTLAND."

THE LECTURER after describing the chief characteristics of boulder clay, said :—that geologists all agreed that this clay, which formed the greater part of the subsoil of the British Isles, was the result of ice action, and that it was

deposited at a time when an Arctic climate prevailed somewhat similar to that at present existing in Spitzbergen. But geologists were not so unanimous in their theories explaining its formation, some holding that it was the result of the action of land ice, and others that it was of marine origin. Special attention had been given to this subject by geologists in the North of Ireland. Major-General Portlock's opinion was that these clays were of marine origin, and in his report on the geology of Londonderry, published in 1843, he gave a list of fossil shells found by Messrs. Brien and Hyndman in boulder clay which was cut through when the reservoir for the Belfast Waterworks was being excavated. Mr. S. A. Stewart, the curator of the Museum, published in 1880 a list of mollusca from Irish boulder clay, in which he recorded sixty-nine species of shells. Examples of *Leda permula* and *Leda pygmæa* were obtained both at Woodburn and the Knock with their valves attached, which proved that they must have lived on the spot where found. Mr. Wright then proceeded to describe his examination of boulder clay from the vicinity of Glasgow, and expressed his indebtness to Mr. James Nelson, vice-president of the Glasgow Geological Society, for his kindness in supplying him with samples of typical Scottish boulder clay. Material from eleven different localities had been examined, and in all of these foraminifera were found. These specimens were all of the same species as those found at present in shallow water off the Irish coast, and, with the exception of *discorbina parisiensis*, had all been found in Irish boulder clay. *Rotalia beccaru*, *nonionina depressula*, and *polystonulla striata punctata* were the most abundant in the clay, and the same species were the most common amongst our shallow-water forms. Mr. Wright concluded by saying that the result of his examination of both the Scotch and Irish boulder clays, and the finding in them of many shallow-water organisms, forced him to the conclusion that the boulder clay both in Scotland and Ireland was of marine origin.

On the motion of Mr. Frank Ward a cordial vote of thanks was passed to Mr. Milligan, and Mr. Wright was also formally thanked for his interesting lecture.

The proceedings then terminated.

17th March, 1897.

PROFESSOR J. D. EVERETT, F.R.S., D.C.L., in the Chair.

MR. JOHN FINNEGAN, B.A., B.SC., delivered a lecture on

"THE HISTORY AND PROPERTIES OF THE RONTGEN RAYS."

MR. FINNEGAN said—About sixteen months ago Röntgen read a short paper before the Physico-Medical Society at Würzburg, to which he gave the title, "A new kind of rays." They all remember the great excitement produced by his discovery, and how eagerly experiments were made in almost every scientific laboratory in the world. He would lay before them the most prominent steps in the history of that discovery—show them some experiments on the X rays, and finally discuss their nature. The apparatus required consisted of an induction coil and exhausted glass tubes, of which he should show them several in the course of the evening. The lecturer here showed a glass tube thirty inches long and two inches diameter. Into its ends were fused platinum wires. These were connected with the coil. The positive terminal was called the anode, and the negative the cathode. The air could be removed from the tube by this pump. When 1·100 part of the air remained, a thin purple line of light traverses the tube. As the pump continued to work this line got wider, and filled the tube, and when about 1·1500 of the air was left a velvety glow covered the cathode. Then they had a dark space, called the Crookes's space. Adjoining this space was a luminous column—the negative glow, then another dark space, and finally a luminous column stretching right up to the positive electrode. The positive column was

beautifully striated, the striations having an irregular motion backwards and forwards along the tube. When the pump was worked so that about 1·10000 of the air was left, the dark space round the negative electrode expanded and filled the whole tube. The light only came from the surface of the glass. The discharge now seemed to come off entirely from the cathode. It moved in straight lines, and did not curve back to the anode. When it struck the glass the glass gave a brilliant phosphorescence ; if it fell upon platinum, the platinum became hot. A radiometer in its path rotates and phosphoresces beautifully. These cathode rays cast a shadow of a solid object placed in their path, and, lastly, they were deflected by a magnet like a flexible wire conveying a negative current. Those were the discoveries of Hettorf, Goldstein, and Crookes, and were made fourteen or fifteen years ago. Crookes's explanation of these phenomena was—"The molecules of the gas remaining in the tube are drawn towards the cathode, get charged, are so violently repelled that their shock against the glass caused it to phosphoresce and the radiometer to rotate." In 1892 Hertz showed that, while many substances transparent to ordinary light were opaque to cathode rays, thin sheets of metal were very transparent to cathode rays. Hitherto those rays had only been examined in a vacuum. Lenard now pierced a hole in the tube opposite the cathode, and closed this hole with a thin leaf of aluminium. The cathode rays now passed out of the tube, and he found that they caused fluorescence on a prepared screen. They discharged a gold leaf electroscope and blackened a photographic plate, and were mostly deflected by a magnet. Lenard used a tube with a very small window, and only worked a few seconds at each experiment, and so narrowly missed anticipating Röntgen. Röntgen's discovery was simply that when the cathode rays struck a solid substance the point struck became an origin of an entirely new set of rays. The tubes for the production of Röntgen rays were mostly modifications of the so called focus tube invented by Mr. Jackson, of London. The tube he (Mr. Finnegan) was using had a spherical bulb. At one side there was a cap of aluminium

forming the cathode. In the centre of the bulb facing the cathode was a square piece of platinum foil forming the anode. These were connected with the coil by platinum wires fused into the glass. The tube was well exhausted ; only about 1·10000 of the original air remained. When the coil was working the negative rays passed out normally from the cathode, and were focussed upon the platinum anode, which became an intensely strong source of Röntgen rays. These rays then travelled out into space, just as light rays did from a lamp. (1) Röntgen rays were invisible. The tube was enclosed in a wooden box, and giving rays out freely, and yet they could see nothing. (2) They made certain substances luminous when they fell upon them. The best substance was barium-platino-cyanide. Mr. Finnegan produced a paper screen, coated on one side with this salt. When the X rays struck it the screen was quite bright, almost as bright as if it were illuminated by a candle. (3) Many substances transparent to ordinary light were quite opaque to X rays When a glass bottle containing water was held between the Röntgen tube and the screen, a very dark shadow was cast on the screen. On the other hand, many substances quite opaque to ordinary light were transparent to X rays. This wooden box, containing cotton wool allowed most of the rays to pass through; the nails which fastened it, and an iron bicycle wrench in it, were opaque, and cast a deep shadow. Flesh was much more transparent than bone, and so, if he held his hand in front of the Röntgen lamp, there was a faint shadow of the flesh and a deep shadow of the bone. With this tube and coil could be easily seen the shadow of the ribs and the motion of the diaphragm. After long and frequent exposures the skin gets irritated, affected with something like acute sun-burning. The nails might even be shed. (4) X rays acted on an ordinary photographic dry plate. The pictures they saw were produced by wrapping a plate in black paper. Place upon it the object, and expose it to the X rays a few minutes, then develope it in the usual way and they had a picture, the difference in density

of the various parts corresponding to the differences of opacity of the various parts of the object. (5) A curious effect of X rays was their power of discharging electrified bodies. When a gold leaf electroscope was charged, and the X rays fell upon it, immediately the leaves collapsed. (6) X rays suffered very little reflection or refraction, and thus they could not bring them to a point by mirrors or lenses. (7) Unlike cathode rays or Lenard rays they were not deflected by a magnet. Turning next to the question of theory, he wished to say, first, a few words about light. They knew that light consisted of transverse vibrations in the ether, the rate of vibration varying with the colour; thus violet rays had about twice as many vibrations per second as red rays. Now, besides those visible rays there were rays of the same intrinsic nature, some of fewer vibrations, the infra red, which had been carefully measured by Langly in America; others of a greater number of vibrations per second, the ultra violet, which had been investigated by Schuman in Austria. Taking the analogy of sound, and remembering that when one note had just twice as many vibrations as another, they called it an octave of that note. They could easily imagine a scale of light consisting of six octaves, like the notes on a piano—three octaves of infra red; then in the centre the seven colours: red, orange, yellow, green, blue, indigo, violet, and next two octaves of ultra violet. Now, violet and ultra violet rays falling on a fluorescent substance made it luminous—indeed, this was how ultra violet rays were discovered. X rays did the same. Ultra violet rays discharge a negatively electrified body. They had seen the effect of X rays. From these analogies they might say that there was a strong presumption that X rays are of the same intrinsic nature as ordinary light. On the other hand, the absence of reflection and refraction in X rays seemed to go against this. Now, Helmholtz, a few months before his death, a good while before the discovery of X rays, published a paper in which he proved that for extremely rapid vibrations there would be no refraction. Various considerations lead them to think that X rays were of this nature;

that, in fact, they were about eight octaves above the green in our colour scale. There was reason to believe that a portion of the gap between the ultra violet and X rays had been filled. Becquerel, inside the past year, had shown that if uranium salts were scattered over a wooden box containing a photographic plate, and exposed to sunlight, the salts acquired and retained for more than fifteen days the power of giving out rays, which passed through the box and blackened the plate. He had also proved that these were most probably ultra violet rays of very high number of vibrations.

At this stage a number of pictures were thrown upon the screen for the purpose of showing what are the applications of X rays in surgery. They could all see, said Mr. Finnegan, that physical science had received by this discovery an agent which promised to be of great service in investigating some of the outstanding problems in the properties of matter.

The lecture, which was profusely illustrated, was listened to with great attention; and

On the motion of Mr. John Brown, seconded by Professor FitzGerald, a vote of hearty thanks was passed to Mr. Finnegan.

6th April, 1897.

Professor J. D. Everett, F.R.S., D.C.L., in the Chair.

Mr. Ernest W. MacBride, M.A., B.SC., delivered a lecture on

"STARFISH AND SEA URCHINS: THEIR HAUNTS AND HISTORY."

Mr. MacBride proceeded with his lecture, which was illustrated by a special series of lantern slides thrown on the screen by Mr. Nicholl. He prefaced a most interesting discourse, which described in detail the various species of starfish and sea urchins by pointing out that the investigation of these animals proved the fact that nature did not consist of isolated things, but was a coherent whole; that the laws of life which had fashioned the sea urchins were the same which had operated in human history. The lecturer then described in popular fashion the life history of starfish and vertebrate animals with the view of showing that both emerged from the same ancestors. Even if this, however, were not the case, the identity of the laws of life governing our own frame with those which had moulded the humblest denizens of the sea would justify Tennyson when he with true philosophical insight said of the flower.

"If I could understand
What you are, root and all, and all in all,
I should know what God and Man is."

"There is more difference," said the great German naturalist Nagele," between the simplest microbe and dead matter than between the microbe and man."

On the motion of Dr. SHELDON, seconded by Professor BYERS, and supported by Mr. R. L. PATTERSON, J.P., the hearty thanks of the meeting were accorded to Mr. MacBride for his lecture.

27th January, 1897.

Professor J. D. Everett, F.R.S., D.C.L., in the Chair.

Mr. William Nicholl delivered a lecture on the

"ELECTRIC CINEMATOGRAPH."

Mr. William Nicholl said the wonderful development which the projection of pictures on the screen had received by the perfecting of the optical lantern, and the adaptation to it of the electric arc lamp had enabled the inventor to construct a mechanical contrivance which would project pictures, and change them at the rate of from twenty to forty per second of time. Those machines had been named by their various makers the cinematograph, the theatograh, the vitagraph, and a variety of other titles, but the principle was always the same, only the mechanical parts varied. To project pictures and exhibit them on a screen they must first take them, and to do so had only been possible for a very limited period. With the old collodion process of photography this was quite impossible. When the extremely rapid gelatine plate was introduced, the pictures could be taken quick enough, but the glass plates could not be changed in the camera, so that it needed not only the quick emulsion but a quick flexible support, and this was supplied by the celluloid ribbon, and it was now possible to take photographs at the rate of some forty per second. Before describing the pictures he proposed to glance at the early attempts to produce the effect of life or motion by means of pictures. A retrospect of some sixty years would cover the time when those attempts had been before the public. Some-

where about 1835 the management of the Polytechnetic Institution of London introduced into their exhibition an invention of Dr. Paris called a thaumatrope. This was quickly superseded by another called the phenakistascope or wonder turner. The Instrument that was shown upon the screen was made by Dubose, the optician, of Paris, from details supplied by the inventor, Plateau, who was a blind man. In this there was a disc of glass, on which was painted the picture in a series of stages, and also a wheel having a number of lenses on the edge, and as those were made to revolve the pictures and lenses met opposite the tube when the picture was projected on the sheet, and as those must coincide the mechanism had to be very carefully made. The circle and pictures in one form of this device was below the slits, and to use it it was necessary to stand before a mirror and look at the reflected image through the slits, and make the disc revolve when the circle of pictures all seemed in motion, but should they look over the edge no pictures would be visible, only a confused series of eccentric or circular blurs. That was due to the well known law of the persistence of vision, and it was that law which made it possible to construct those instruments at all. Most of the audience knew that any changes occurring at a greater speed than about eight in a second the eye could not perceive; so, in order to make the rapid changes visible, they must interpose a period of rest or darkness having a certain ratio to the time the object was visible. That proportion he had not found stated in any text-book, and he had not had anyone to work it out, but he was sure it would vary in different individuals. Having pointed out some peculiarities about the old familiar zostrope, Mr. Nicholl went on to explain that in all those appliances there was a similiarity of design, and as the principle was a fixed one there was little room for change. In the wheel-of-life lantern slide there was a small circle of glass 2½ inches in diameter having the figures photographed on it, and another circular plate of metal with one cut in it. When that was made to revolve the figures seemed all to be in motion. He next

referred to the work of Mr. Maybridge, an American gentleman, who made the study of motion a speciality. He had constructed a sort of battery of cameras, and a kind of racecourse prepared opposite them, and with an electric arrangement he could reverse the shutters of the lenses at fixed points, so as the horse or any other kind of animal passed in front there was recorded the exact attitudes, and although his results were very surprising, indeed, considering he had only the wet collodion process of photography, and the fact that each picture required a separate camera, and those cameras required a considerable time to recharge them with the sensitive plates, it was quite evident he could never hope to produce anything like the results that had been achieved since. Alluding to Mr. Edison, the lecturer said, in "Cassells' Magazine" he was credited with stating that in the year 1887 the idea occurred to him that it was possible to do for the eye what the phonograph had done for the ear, and by combining them both motion and sound could be reproduced simultaneously. Edison's first attempt was of a microscopic character. It was stated that in his practice there was an exposure given to each of nine-tenths of one-forty-sixth of a second, and that the mechanism in the machine moved the sensitive tissue forward the breadth of the picture in the remaining one-tenth of one-forty-sixth of one second, so there were forty-six distinct pictures taken for each second of time. That would make 2,760 pictures per minute, and 165,000 in one hour, and short as those exposures seemed, the photographers present knew that it was quite possible to get good pictures full of detail in that time at somewhere about the one-hundredth of a second. The lecturer described Edison's studio or theatre, which was specially erected to produce these pictures. Both the phonograph and kinematoscope were driven by electric motors, and the entire building was poised on a centre, and could be made to turn round, and thus keep the sun shining on the stage all the day. Of course, the ribbon of pictures, as taken in the camera was a negative image, and there must be printed from it a positive, so the making of

those pictures would never be a very simple process. The developing and printing the stripes would always be a difficulty, for they had to handle and manipulate in the chemical baths a piece of tissue about 75 feet long, and if any part was too long in those baths it would be spoiled, and should a single ray of white light get to it, no matter how faint, it would be destroyed. In conclusion, Mr. Nicholl explained the movements of the cinematograph.

The lecture was profusely illustrated, and at its conclusion a series of splendid views were shown. The lantern was manipulated by Mr. Drennan and Mr. Haffron, and the electric light was kindly supplied by the Messrs. Wm. Ewart & Son, Limited, the cable being lent by Mr. Greenhill.

On the motion of Professor Redfern, seconded by Mr. George Andrews, a hearty vote of thanks was passed to Mr. Nicholl.

BELFAST
Natural History & Philosophical Society.

Officers and Council of Management for 1897-98.

President:
PROFESSOR J. D. EVERETT, F.R.S., D.C.L., &c.

Vice-Presidents:

JOHN BROWN, Esq.
THOMAS WORKMAN, Esq., J.P.
J. A. LINDSAY, Esq., M.D., M.A.
WM. SWANSTON, Esq., F.G.S.

Hon. Treasurer:
JOHN BROWN, Esq.

Hon. Assist. Treasurer:
W. H. F. PATTERSON, Esq.

Hon. Librarian:
THOMAS WORKMAN, Esq., J.P.,

Hon. Secretary:
ROBERT M. YOUNG, Esq., B.A., J.P., M.R.I.A.

Council:

JOHN BROWN, Esq.
PROFESSOR J. D. EVERETT, F.R.S., D.C.L.
LAVENS M. EWART, Esq., J.P., M.R.I.A.
PROFESSOR M. F. FITZGERALD, B.A., M.I.M.E.
JOHN H. GREENHILL, Esq., Mus.Bac.
JOHN HORNER, Esq.
JAMES A. LINDSAY, Esq., M.D., M.R.C.P.Lond.
R. LLOYD PATTERSON, Esq., J.P., F.L.S.
WM. H. PATTERSON, Esq., M.R.I.A.
THOMAS F. SHILLINGTON, Esq.
WM. SWANSTON, Esq., F.G.S.
THOMAS WORKMAN, Esq., J.P.
JOSEPH WRIGHT, Esq., F.G.S.
ROBERT YOUNG, Esq., J.P., C.E.
R. M. YOUNG, Esq., B.A., J.P., M.R.I.A.

SHAREHOLDERS

[**Denotes holders of three or more Shares.*]

*Alexander, Francis, B.E.,	Belfast.
Allworthy, Edward, Ardgreenan, Cavehill Road,	do.
Anderson, John, J.P., F.G.S., East Hillbrook,	Holywood.
Andrew, John J., L.D.S., R.C.S. Eng. Belgravia,	Belfast.
Andrews, Miss Elizabeth, College Gardens,	do.
Andrews, George, J.P., Ardoyne,	do.
Armstrong, Thomas, jun., Donegall Square West,	do.
Barbour, James, J.P., Ardville, Marino,	Holywood.
Beattie, Rev. A. Hamilton,	Portglenone.
Bigger, Francis J., Ardrie, Antrim Road,	Belfast.
Bland, Robert H., J.P.,	Lisburn.
Bottomley, Henry H., Cultra,	Holywood.
Boyd, William, Blackstaff Mill,	Belfast.
Boyd, William Sinclair, Ravenscroft, Bloomfield,	do.
Braddell, Edward, The Limes, Malone Park,	do.
Brett, Charles H., Gretton Villa South, Malone Road,	do.
Brett, John H., C.E., Fortwilliam Park,	do.
Bristow, James R., Lismore, Windsor Avenue,	do.
Brown, John, Longhurst,	Dunmurry.
Brown, William K. (Representatives of),	Belfast.
Bulloch, Alexander, Eversleigh, Malone Road,	do.
Burnett, John R., Rostellan, Malone Road,	do.
Byers, Prof. John W., M.A., M.D., University Road,	do.
Calwell, Alex. M'D.,	do.
Calwell, William, M.A., M.D., College Square North,	do.
*Campbell, Miss Anna (Representatives of),	do.
Campbell, James, Strandtown,	do.
Carlisle, A. M., Elmwood House,	do.

Carr, A. H. R., Rathowen, Windsor Avenue, Belfast.
Carson, John, Walmer Terrace, Holywood.
*Charley, Phineas H., Mornington Park, Bangor.
Clark, George S., Dunlambert, Belfast.
Coates, Victor, J.P., D.L., Rathmore, Dunmurry.
Connor, Charles C., M.A., J.P., Queen's Elms, Belfast.
Cowan, P. C., M.I.C.E., College Gardens, do.
Crawford, William, Mount Randal, do.
Crawford, William, Calendar Street, do.
Cuming, Professor James, M.A., M.D., Wellington Place, do.
Cunningham, Professor Robert O., M.D., F.L.S., F.G.S., Montpellier, Malone Road, do.

Davies, John H., Glenmore Cottage, Lisburn.
*Deramore, Lord, D.L. (Representatives of), Newtownbreda.
Dods, Robert, B.A., Dunluce Terrace, Belfast.
*Donegal, Marquis of, do.
*Downshire, Marquis of, The Castle, Hillsborough.
Drennan, W. H., Fountain Street, Belfast.
Duffin, Adam, LL.D., University Square, do.
Dunleath, Lord, Ballywalter Park (Reps. of), Ballywalter.

Everett, Professor Joseph D., M.A., D.C.L., F.R.S., Derryvolgie Avenue, Belfast.
Ewart, G. Herbert, Firmount, Antrim Road, do.
Ewart, Lavens M., J.P., M.R.I.A., Glenbank House, do.
Ewart Sir Wm. Quartus, Bart., J.P., Glenmachan House, do.

Faren, Wm. 45, Waring Street, Belfast.
Fagan, John, F.R.C.S.I., J.P., Dublin.
*Fenton, Francis G., London.
Ferguson, Godfrey W., Donegall Park, Belfast.
Finlay, Robert H. F., Hughenden Avenue, do.
Finnegan, John, Botanic Avenue, do.
Finlay, Fredk. W. Wolfhill House, Ligoniel.

FitzGerald, Professor Maurice F., B.A., M.I.M.E., Assoc. M.I.C.E., Eglantine Avenue, Belfast.

*Getty, Edmund (Representatives of), do.
Gibson, Andrew, Cliftonville Avenue, do.
Girdwood, Catherine, Mountpleasant,
Gordon, Robert W., J.P. (Reps. of), Bangor.
Graham, Thomas, J.P., Holywood.
*Grainger, Rev. Canon, D.D., M.R.I.A., (Representatives of), Broughshane
Gray, William, M.R.I.A., Glenburn Park, Cavehill Road. Belfast.
Greenhill, John H., Mus. Bac., do.
Greer, Thomas, J.P., M.R.I.A., Seapark, Carrickfergus.

*Hall, Frederick H., Waterford.
*Hamilton, Hill, J.P. (Representatives of). Belfast.
Harland, Sir E. J., Bart., J.P. (Representatives of),
Heburn, William (Representatives of), Belfast.
Henderson, Miss Anna S. (Representatives of), do.
Henderson, James, A.M., Oakley, Windsor Park, do.
Henderson, Robert (Representatives of), London.
Herdman, John, J.P., Carricklee House, Strabane.
*Herdman, Robert Ernest, Rosavo, Cultra.
Heyn, James, A.M., Strandtown House, Belfast.
Hind, John, jun., Clifton Park Avenue, do.
Hodges, Professor John F., M.D,, F.C.S., J.P., Sandringham, Belfast
Hogg, John, Academy Street, do.
Horner, John, Mount Clifton, Cliftonville, do.
*Houston, John Blakiston, J.P., V.L., Orangefield, do.
*Hughes, Edwin, Mertoun Hall, Holywood.
Hyndman, Hugh, LL.D., Windsor, Belfast.
Jackson, A. T., C.E., Tighnabruaich, Derryvolgie Avenue, Belfast
Jaffé, Otto, Kin Edar, Strandtown, do.

Inglis, James, J.P., Abbeyville, Whiteabbey.

Johnston, Samuel A., J.P., Dalriada, Whiteabbey.

Kennedy, James, J.P., Richmond Lodge (Reps. of), Belfast.
Kennedy, William (Representatives of), Kenbella House, do.
Kertland, Edwin H., Chlorine Gardens, do.
Kidd, George, J.P., Lisnatore, Dunmurry.
*Kinghan, James, Altoona, Windsor Avenue, Belfast.
Kyle, Robert Alexander, Ardstratha, Antrim Road, do.

Lanyon, John, C.E., Lisbreen, Fortwilliam Park, do.
Larmor, Joseph, M.A., St. John's College, Cambridge.
Leathem, Dr. Robert, Belgravia, Lisburn Road, Belfast.
Lemon, Archibald Dunlap, J.P., Edgecumbe, Strandtown, do.
Lepper, F. R., J.P., Elsinore, Carnalea, Co. Down.
Letts, Professor E. A., Ph.D., F.C.S., Dunavon, Craigavad.
Lindsay, James A., M.A., M.D., Victoria Place, Belfast.
Lytle, David B., J.P., Bloomfield House, do.
Lytle, Joseph H. J.P., Ashleigh, Windsor Avenue, do.

Macassey, L. Livingstone, B.L., M.I.C.E., Stanley House, Holywood.
Macfarlane, John, Bladon Park, Belfast.
Mackenzie, John, C.E., Strathavon, Lisburn Road, do.
*Macrory, A. J. (Representatives of) do.
Magill, J. E., Easton Terrace, Cliftonville, do.
Malcolm, Bowman, M.I.C.E., Ashley Park, Antrim Road, do.
Maxton, James, The Elms, Strandtown.
Maxwell, David A., College Gardens, Belfast.
Milligan, Seaton Forest, M.R.I.A., Alberta, Malone Road, do.
Mitchell, Robert A., Marmont, Strandtown.
Montgomery, Henry C., Newtown Lodge, Newtownbreda.
Montgomery, H. H., Magee's Road, Strandtown, Belfast.
Montgomery, Thomas, J.P., Ballydrain House, Dunmurry.

Moore, James, The Finaghy,	Belfast.
Mullan, William, Lindisfarne, Marlborough Park,	do.
Murney, Henry, M.D., J.P., Tudor House,	Holywood.
*Murphy, Isaac James,	Armagh.
*Murphy, Joseph John (Representatives of),	Belfast.
Murray, Robert Wallace, J.P., Fortwilliam Park,	do.
Musgrave, Edgar, Drumglass, Malone,	do.
*Musgrave, Henry, Drumglass, Malone,	do.
Musgrave, Sir James, Bart., J.P., Drumglass, Malone,	do.
MacAdam, Robert (Representatives of),	do.
M'Bride, Henry James, Hyde Park, Mallusk,	do.
M'Bride, Samuel, Westbourne, Windsor,	do.
*M'Calmont, Robert (Representatives of),	London.
*M'Cammon, Lieut. Col. Thomas A.,	Woodville, Holywood.
M'Cance, H. J., J.P., D.L., Larkfield,	Dunmurry.
M'Clure, Sir Thomas, Bart., J.P., D.L. (Reps. of),	
MacColl, Hector, Saxonia, Strandtown,	Belfast
MacCormac, John, M.D., Victoria Place,	do.
M'Cormick, Hugh M'Neile, Ardmara,	Craigavad.
*M'Cracken, Francis (Representatives of),	
M'Gee, James, Woodville,	Holywood.
M'Gee, Samuel Mackey, University Street,	Belfast.
MacIlwaine, John H., Upper Crescent,	do.
*MacLaine, Alexander, J.P., Queen's Elms,	do.
M'Neill, George, Beechleigh, Malone Road,	do.
M'Knight, John P., Nevara, Chichester Park,	do.
Neill, Sharman D., Rowandean, Marlborough Park,	do.
Nicholson, Henry J., West Elmwood,	do.
O'Neill, James, M.A., College Square East,	do.
*O'Rorke, Ambrose Howard,	Dunratho, Craigavad.
Park, Rev. Wm., M.A., Somerset Ho., University St.,	Belfast.
Patterson, Edward Forbes, College Gardens,	dc.
Patterson, Mrs. Isabelle, Bonn,	Germany.

Patterson, Richard, J.P., Kilmore, Holywood.
*Patterson, Robert Lloyd. J.P., F.L.S., Croft House, do.
Patterson, Robert, Osborne Park, do.
Patterson, William H., M.R.I.A., Garranard, do.
Patterson, William R., College Park East, do.
Pim, Edward W., Elmwood Terrace, do.
Pim, Joshua, Slieve-na-Failthe, Whiteabbey.
*Pirrie, Elizabeth, Newcastle-on-Tyne.
Pooler, Rev. L. A., B.A., Lake Cottage, Downpatrick.
Praeger, R. Lloyd, B.E., M.R.I A., National Library, Dublin.
Purser, Prof. John, LL.D., M.R.I.A., Queen's College, Belfast.

Rea, John Henry, M.D., Shaftesbury Square, do.
Rea, William R., Gardha, Fortwilliam Park, do.
Reade, Robert H., J.P., Wilmont, Dunmurry.
Riddel, Samuel, Beechpark, Belfast.
Robertson, William, J.P., Netherleigh, Strandtown, do.
Robinson, John, Sydenham Road, do.

Scott, R. Taylor, Richmond Villa, Derrivolgie Avenue, do.
Sheldon, Charles, M.A., D.Lit., B.Sc., Royal Acad. Institution, do.
Shillington, Thomas Foulkes, Dromart, Antrim Road, do.
Simms, Felix Booth, Queen Street, do.
Sinclair, Thomas, M.A., J.P., D.L., Hopefield, do.
Sinclair. Prof. Thomas, M.D., F.R.C S. Eng., Howard St., do.
Smith, John, Castleton Terrace, do.
Smyth, John, M.A., C.E., Milltown, Banbridge.
Speers, Adam, B.Sc., Riversdale, Holywood.
Steen, Robert, Ph.D. (Representatives of), Belfast.
Steen, William, B.L., Northern Bank, Victoria Street, do.
Stelfox, James, Oakleigh, Ormeau Park, do.
Swanston, William, F.G.S., Cliftonville Avenue, do.

*Tennent, Robert (Representatives of), Rushpark, do.
*Tennent, Robert James (Reps. of), Rushpark, do.

*Thompson, James, J.P., Macedon,	Whiteabbey.
Torrens, Mrs. Sarah H. (Representatives of),	do.
*Turnley, John (Representatives of),	Belfast.
Valentine, G. F., Sandhurst, Knock,	do.
Walkington, Mrs., Thornhill, Malone,	do.
Walkington, Thomas R., Edenvale, Strandtown,	do.
Wallace, John, Chlorine Gardens, Malone Road,	do.
Ward, Francis D., J.P., M.R.I.A., Elmwood Avenue,	do.
Ward, Isaac, Lisburn Road,	do.
Ward, John, J.P., Lennoxvale, Malone Road,	do.
*Webb, Richard T., Knock,	do.
Whitla, Prof. William, M.D., J.P., College Sq. North,	do.
Wilson, James, M.E., Oldforge,	Dunmurry.
Wilson, John K., Inch Marto, Marlborough Park,	Belfast.
Wilson, Walter H., Stranmillis House,	do.
*Wilson, W. Perceval,	do.
*Wolff, G. W., M.P., The Den, Strandtown,	do.
Workman, Francis, Drummena, Bladon Park,	do.
Workman, John, J.P., Lismore, Windsor,	do.
Workman, Rev. Robert, M.A., Rubane House,	Glastry.
Workman, Rev. Robert, B.D., The Manse,	Newtownbreda.
Workman, R. D., Upper Crescent,	Belfast.
*Workman, Thomas, J.P., Craigdarragh,	Craigavad.
Workman, William, Nottinghill,	Belfast.
Wright, James, Lauriston, Derryvolgie Avenue,	do.
Wright, Joseph, F.G.S., Alfred Street,	do.
Young, Robert, C.E., Rathvarna,	do.
*Young, Robert Magill, B.A., Rathvarna,	do.

HONORARY MEMBER.

Stokes, Miss M., Hon. M.R.I.A., Carrig Breac, Howth, Co. Dublin.

HONORARY ASSOCIATES.

Gray, William, M.R.I.A., Mountcharles,	Belfast.
Stewart, Samuel Alex., F.B.S. Edin., Belfast Museum,	do.
Swanston, William, F.G.S., Cliftonville Avenue,	do.
Tate, Prof. Ralph, F.G.S., F.L.S., Adelaide,	South Australia.
Wright, Joseph, F.G.S., Alfred Street,	Belfast.

ANNUAL SUBSCRIBERS OF TWO GUINEAS.

Belfast Banking Company, Ltd.,	Belfast.
Northern Banking Company, Ltd.,	do.
Ulster Bank, Ltd.,	do.
York Street Spinning Company, Ltd.,	do.

ANNUAL SUBSCRIBERS OF ONE GUINEA.

Allan, C. E., Stormont Castle,	Dundonald.
Armstrong, William, Fortwilliam Terrace,	Belfast.
Barr, James, Beechleigh, Windsor Park,	do.
Barton, H. D. M., The Bush,	Antrim.
Boyd, John, 20 Cyprus Gardens, Bloomfield,	Belfast.
Brown, G. Herbert, J.P., Tordeevra,	Helen's Bay.
Bruce, James, D.L., J.P., Thorndale House,	Belfast.
Carr, James, Rathowen, Windsor,	do.
Cleaver, A. S., B.A., Dunraven,	do.
Crawford, F. H., Chlorine House, Malone Road,	do.
Dalton, J. P., M.A., Roseberry Villa, Antrim Road,	do.
Davidson, S. C., Sea Court,	Bangor.
Dunville, Robert G., J.P., D.L., Redburn,	Holywood.
Foster, Thos. A., Clonsilla, Antrim Road,	Belfast.
Frizelle, Rev. C. W., 2, Cyrene Villa, Cliftonpark Avenue,	do.
Fulton, E. F.,	do.
Gamble, James, Royal Terrace,	do.

Green, Isaac, Ann Street,	Belfast.
Hanna, J. A., Marietta, Knock,	do.
Hazelton, W. D., Cliftonville,	do.
Higginbotham, Granby, Wellington Park,	do.
Johnston, James, Ivy Dene, Antrim Road,	do.
Jones, A. L. Waring Street,	do.
Jones, R. M., M.A., Royal Academical Institution,	do.
Kelly, W. Redfern, M.I.C.E., F.R.A.S., Dalriada, Malone Park,	do.
Lynn, William H., Crumlin Terrace,	do.
Malone, John, Brookvale House, Cliftonville,	do.
Matier, Alexander S., Lorne,	Craigavad.
Murdoch, James, Ponsonby Avenue,	Belfast.
M'Causland, William, Cherryvale House,	do.
M'Kee, William S., Fleetwood Street,	do.
M'Laughlin, W. H. Brookville House,	do.
Redfern, Prof. Peter, M.D., F.R.C.S.I., Lower Crescent,	do.
Scott, Conway, C.E., Annaville, Windsor Avenue,	do.
Swiney, J. H. H., B.A., B.E., Bella Vista, Antrim Road,	do.
Tate, Alexander, C.E., Rantalard, Whitehouse,	do.
Taylor, John, Brown Square Works,	do.
Thompson, John, Limestone Road,	do.
Turpin, James, Waring Street,	do.
Walkington, R. B., Carriggorm,	Helen's Bay.
Walter, Hermann, M.A., Ph.D., Botanic Avenue,	Belfast.

Report and Proceedings

OF THE

BELFAST

NATURAL HISTORY & PHILOSOPHICAL SOCIETY

FOR THE

SESSION 1897-98.

BELFAST:
PRINTED BY ALEXR. MAYNE & BOYD, 2 CORPORATION STREET
(PRINTERS TO QUEEN'S COLLEGE.)

1899.

CONTENTS.

Belfast Natural History and Philosophical Society.

:o:

ESTABLISHED 1821.

:o:

SHAREHOLDERS.

1 Share in the Society		costs £7.
2 Shares	,,	cost £14.
3 Shares	,,	cost £21.

The proprietor of 1 Share pays 10s. per annum ; the proprietor of 2 Shares pays 5s. per annum ; the proprietor of 3 or more Shares stands exempt from further payment.

Shareholders are only eligible for election on the Council of Management.

MEMBERS.

There are two classes—Ordinary Members, who are expected to read Papers, and Visiting Members, who, by joining under the latter title, are understood to intimate that they do not wish to read Papers. The Session for Lectures extends from November in one year till May in the succeeding one. Members, Ordinary or Visiting, pay £1 1s. per annum, due 1st November in each year.

Each Shareholder and Member has the right of personal attendance at all meetings of the Society, and of admitting a friend thereto : also of access to the Museum and Library for himself and family, with the privilege of granting admission orders for inspecting the collections for any friend not residing in Belfast.

Any further information can be obtained by application to the Secretary. It is requested that all accounts due by the Society be sent to the Treasurer.

The Museum, College Square North, is open daily from 10 till 4 o'clock. Admission for Strangers, 6d. each. The Curator is in constant attendance, and will take charge of any Donation kindly left for the Museum or Library.

Belfast Natural History and Philosophical Society.

ANNUAL REPORT, 1897.

THE Annual Meeting of the Shareholders of the Society was held yesterday afternoon in the Belfast Museum, College Square North—Mr. R. Lloyd Patterson, F.L.S., J.P., presiding. The attendance included—Dr. Robert Leathem, Messrs. G. Kidd, J.P.; R. M. Young, B.A., J.P.; Robert Young, J.P.; Robert Patterson, W. H. Patterson, M.R I.A., E. F. Patterson, Isaac Ward, J. E. Magill, and Edward Allworthy. Letters of apology were received from Professor Fitzgerald and Dr. Sheldon.

The SECRETARY (Mr. R. M. Young) having read the notice convening the meeting, submitted the Report of the Council for the past year, which was as follows :—The Council of the Belfast Natural History and Philosophical Society desire to submit their Report of the working of the Society during the past year. The winter session was opened on the 9th November, 1897, in the Museum, when Major-General Geary, C.B., kindly delivered a lecture on the subject of "Industrial Training and Technical Education," which was followed by a discussion. The second meeting was held on 3rd December, when Dr. John MacCormac read a paper—subject, "Abnormal Ideas and Nervous Super Excitability.' The third meeting on the 4th January, 1898, was devoted to a popular lecture, "Ireland as a tourist resort, and what is being done to develop it," delivered by Mr. S. F. Milligan, M.R.I.A., in aid of the Causeway defence fund. The chair was occupied by the Lord Mayor. The fourth meeting was held on

1st February, when Miss Edith Oldham, honorary secretary, Feis Ceoil, Dublin, delivered a lecture on "The Feis Ceoil and the Eisteddfod," with musical illustrations. At the fifth meeting, on the 1st of March, Mr. W. H. Morris, M.I.C.E.I., gave a lecture on "Railways and their Practical Working," illustrated by lantern views. The sixth meeting was held on 26th April, when Mr. James Maxton, M.I.N.A., read a paper—subject, "The Evolution of Dry Docks"—followed by a discussion. Mr. Robert Young, J.P., gave "Notes on the Geological Bearings of recent Deep Borings at Belfast," illustrated by specimens. The meetings continue to be well attended, and the lectures attract the general public, particularly when discussions are invited. Kindred societies continue to make their headquarters at the Museum, and the Feis Ceoil was added to their number last autumn.

From the Treasurer's Statement of Accounts it will be seen that a satisfactory balance remains in his hands. All the collections were thrown open to the public at a nominal charge on Easter Monday and Tuesday, and the attendance was large. As to the Museum specimens, there are no important changes to report. The stone Inauguration Chair from Castlereagh has been mounted on a stand, and has a suitable place amongst the other Irish antiquities. The stand, however, is not a fixture, but moveable, and the chair, though weighing some 6cwt., can be shifted as required on special occasions. The valuable set of Snakes from Assam, presented by Mr. A. de Wind, have had the preservative spirit renewed, and will be permanently arranged with the existing series of foreign reptiles. The Society is to be congratulated on the acquisition of the ancient stone chair of the O'Neills, of Castlereagh, which was purchased from Mr. W. Walker, J.P., of Sligo, by a number of friends of the Society, and presented on their behalf, to the Museum by the late Sir Wm. M'Cammond, at the opening meeting of the Session. A number of early Christian antiquities from Oxyrhynchus have been presented by the Egyptian Exploration Fund. Several other notable donations have been made by

Messrs. Victor Coates, D.L. ; G. Donaldson, and others. The Council desire to thank most heartily the local Press for the admirable reports of the meetings of the Society. In accordance with the constitution of the Society, this meeting will be asked to elect five members of Council for the ensuing year, in place of the following, who retire by rotation, the first four of whom are eligible for re-election :—viz., Messrs. R. L. Patterson, W. H. Patterson, J. Horner, R. Young, and Dr. J. A. Lindsay,

The SECRETARY also presented the Treasurer's Report, from which it appeared that there was a credit balance of £45 1s. 0½d.

Mr. E. ALLWORTHY, in moving the adoption of the Report and Statement of Accounts, said he did so with much pleasure. They had had for many years very great pleasure in coming to the meetings, and they always had the satisfaction of finding the balance on the right side. They were making satisfactory progress, and it only remained for him to congratulate the officers, who had done their duty so well during the year.

Mr. GEORGE KIDD seconded the adoption of the Report which was passed unanimously.

The retiring members of the Council were re-elected, Mr. J. H. Davies taking the place of Dr. Lindsay.

The following office-bearers were elected :—President, Mr. Thomas Workman, J.P. ; Vice Presidents, Professor Fitzgerald, Messrs. J. Brown, W. Swanston, R. Young, J.P. ; Honorary Treasurer, Mr. John Brown ; Honorary Secretary, Mr. R. M. Young, J.P. ; Honorary Librarian, Mr. Thos. Workman, J.P.

On the motion of Mr. R. Young, J.P., seconded by Mr. Isaac Ward, a cordial vote of thanks was passed to the Chairman for presiding.

EDUCATIONAL ENDOWMENTS (IRELAND) ACT, 1885, 48 & 49 Vict.. ch. 78.

The Account of the Council of the Belfast Natural History and Philosophical Society for the year ended 30th April, 1898.

Dr. **Cr.**

CHARGE.

To Balance as per last Account				£23	5	9
,, Amount of Donations, Bequests, and other Endowments received in the year ended 30th April, 1898 ..				9	9	9
,, Amount of Subscriptions received in the year ended 30th April, 1898				117	6	0
,, Amount of Dividends received in the year ended 30th April, 1898				17	8	0
,, Amount of Rents received in the year ended 30th April, 1898				45	16	6
,, Amount of Fees received in the year ended 30th April, 1898				0	6	0
,, Amount of Miscellaneous Receipts in the year ended 30th April, 1898 (not included in the foregoing), viz.:—						
Entrance Fees at door Easter Monday ..	£15	19	10			
Do. do. do. Tuesday ..	4	3	6			
Do. do. for total year ending 30th April, 1898 ..	23	3	0			
				43	6	4
				£256	18	4

DISCHARGE.

By Amount of Payments made in the year ended 30th April, 1898, under the following headings:—						
Maintenance of Premises, &c.	£17	11	9			
Rent and Taxes, &c.	27	11	0			
Salaries	86	9	4			
				£131	12	1
Other Payments, viz.:—						
Printing and Stationery .. .	5	8	1			
Advertising	9	7	2			
Postage and Carriage	4	13	2½			
Fuel and Gas	15	19	10			
Auditor's Fee	1	1	0			
Insurance	6	12	0			
Subscription Egypt Exploration Society ..	2	2	0			
,, Ulster Journal Archaeology ..	0	10	0			
Printing Report	18	6	0			
Inland Revenue Stamps	0	4	0			
Subscription to Irish Naturalist ..	2	2	0			
Cheque Book	0	4	2			
Purchases from Mr. Gray's Collection ..	5	9	9			
Easter Expenses	6	13	6			
Hire of Piano	0	12	6			
Hire of Lantern	1	0	0			
				80	5	2½
Total Payment . ..				£211	17	3½
Balance in favour of this Account on the 30th April, 1898				45	1	0½
Tota				£256	18	4

N.B.—Besides the above Balance there are Sums standing to the credit of this Account in the following Secnrities.—York Street Spinning Co., Ltd., 4½ per cent. Debenture Stock, £400.

We certify that the above is a true Account.

J. H. GREENHILL, Governor.
W. H. F. PATTERSON, Accounting Officer.

Dated this 18th day of May, 1898.

I certify that the foregoing Account is correct.
J. F. MAYNE, Auditor.
21st day of June, 1898.

DONATIONS TO THE MUSEUM, 1897-98.

From Robert J. Welch, Esq.

Specimens of *Hydrobia Jenkinsii*, *Vertigo angustior*, and other land and freshwater shells.

From R. M. Young, Esq., J.P.

A fibre cap from the Sandwich Islands.

From Representatives of the late Thos. G. Fleming, Esq., F.G.S.

Ancient quern, blunderbuss, musket, fowling piece, Colt's revolver, sword, stone celts, arrowheads, umbrella 150 years old.

Also, Arab weapon, fossils, minerals, etc.

From Miss Mackay.

An old engraving, "The Blind Leading the Blind." It was originally the property of her grandfather, Alex. Mackay, then proprietor of the *Belfast News-Letter*.

Presentation from a number of Subscribers.

The ancient stone chair used in the installation of the O'Neills of Castlereagh and Clannaboye.

From Major General Geary, C.B.

An ancient cannon dug up at Victoria Barracks, Belfast.

From N. I. Hill, Esq.

Stone carving of a human hand found about 1827, near Cushendall. Supposed to have formed part of an ancient monument.

From J. H. Greenhill, Esq., Mus.Bac.

Some relics of the Armagh railway accident.

From W. F. M'Kinney, Esq.

A bronze battleaxe from Lough Erne.

From A. de Wind, Esq.

Thirty specimens of snakes preserved in spirits, also some other reptiles, and some insects from Assam.

ADDITIONS TO THE LIBRARY, 1ST MAY, 1897, TILL 1ST MAY, 1898.

ADELAIDE.—Transactions of the Royal Society of South Australia. Vol. 21, parts 1 and 2, 1897.
The Society.

ALBANY.—Forty-eighth Annual report of the Regents of the New York State Museum. Parts 1 — 3, 1894-95. *The University of New-York.*

AUSTIN, TEXAS—Transactions of the Texas Academy of Science. Vol 2, no. 1, 1897. *The Academy.*

BELFAST.—Transactions of the Ulster Medical Society, Session, 1896-97. *The Society.*

BERGEN.—Bergens Museums Aarbog for 1897, and Account of the Crustacea of Norway, by G. O. Sars. Vol. 1, part 3—8. *The Director of the Museum.*

BERLIN.—Verhandlungen der Gesellschaft für Erdkunde zu Berlin. Vol. 24, nos. 4—10, 1897; and vol. 25, nos. 1—3, 1898. *The Society.*

BOLOGNA—Rendiconto delle Sessioni della R. Accademia delle Scienze dell' Istituto di Bologna, Anno 1895-96; and New Series, vol. 1, fasc. 1—4, 1897.
The Academy.

BOSTON—Proceedings of the Boston Society of Natural History. Vol. 27, no. 14; and vol. 28, nos. 1—5, 1897.
The Society.

BREMEN.—Abhandlungen Herausgegeben vom Naturwissenschaftlichen Verein zu Bremen. Vol. 14, part 2, 1897. *The Society.*

BRESLAU—Zeitschrift für Entomologie Herausgegeben vom Verein für Schlessiche Insektenkunde zu Breslau. New Series, part 22, 1897.
The Society.

BRISBANE—Annals of Queensland Museum. No. 4, 1897.
The Trustees.

BRUSSELS.—Bulletin de la Société Botanique, de Belgique. Vol. 35, 1896; and 36, 1897. *The Society.*
Annales de la Sociétié Entomologique de Belgique. Vol. 40, 1896; and 41, 1897. *The Society.*

BUENOS AYRES.—Annales del Museo Nacional. Series 2, vol. 5, 1896-97; and Memoria, 3 parts, 1894-97.
The Director.

CALCUTTA.—Memoirs of the Geological Survey of India. Vol. 25, 1895; vol. 26, 1896; and vol. 27, part 2, 1897. Palæontologia Indica. Series 15, vol. 1, part 1; and vol. 2, part 1, 1897. Series 16, vol. 1, part 1, 1895; and parts 2 and 3, 1897. Records. Vol. 30, parts 2—4, 1897.
The Director of the Survey.

CAMBRIDGE.— Proceedings of the Cambridge Philsophical Society. Vol. 9, part 3, 1896; part 6, 1897; and part 7, 1898. *The Society.*

CAMBRIDGE, MASS.—Bulletin of the Museum of Comparative Zoology. Vol. 30, nos. 5 and 6, 1897; vol. 31, nos. 1—5, 1897; and no. 6, 1898. Also Report of the Curator for 1896-97.
Alex. Agassiz, Curator.

CASSELL.—Abhandlungen und Bericht (42) des Vereins für Naturkunde zu Kassel, 1897. *The Society.*

CHICAGO.—Bulletin No. 1 of the Geological and Natural History Survey, 1896. 39th Annual Report of the Chicago Academy of Sciences, 1897; and Journal of Geology. Vol. 4, No. 3, 1896.
The Academy.

CHRISTIANIA.—Forhandlinger i Videnskabs Selskabet i Christiania for 1896.

The Royal University of Christiania.

DANTZIC.—Schriften der Naturforschenden Gesellschaft in Danzig. New series, vol 9, part 2, 1897.

The Society.

DAVENPORT, IOWA.—Proceedings of the Davenport Academy of Natural Sciences. Vol. 6, 1897.

The Academy.

DUBLIN.—Scientific Transactions of the Royal Dublin Society. Series 2, vol. 5, part 13, 1896; vol. 6, parts 2—7, 1896; and parts 8—13, 1897. Scientific Proceedings. New series, vol. 8, part 5, 1897.

The Society.

EMDEN.—Eighty-first Jahresbericht der Naturforschenden Gesellschaft in Emdem, 1897. *The Society.*

GENOA.—Giornale della Società di Letture e Conversazione Scientifiche di Genova. Anno 19, fasç. 2 and 3, 1897, and fasc. 4, 1898; also Anno 20, fasc. 1, 1898. *The Society.*

GLASGOW.—Proceedings of the Philosophical Society of Glasgow. Vol. 28, 1897. *The Society.*

HALIFAX, NOVA SCOTIA.—Proceedings and Transactions of the Nova Scotian Institute of Science. Vol. 9, part 2, 1896, and part 3, 1897. *The Institute.*

HALLE.—Leopoldina Amtliches Organ der Kaiserlichen Leopoldino Carolinischen Deutschen Akademie der Naturforscher. Vol. 32, 1896, and Nova Acta, vol. 66, no. 3, 1896, and vol. 67, no. 1, 1895. *The Academy.*

HAMBURG.—Abhandlungen ans dem Gebiete der Naturwissenschaften, herausgegeben vom Naturwissenschaftlichen Verein in Hamburg. Vol. 15, 1897. Also Verhandlungen, Series 3, part 4, 1897.

The Society.

INDIANOPOLIS.—Proceedings of the Indiana Academy of Science, Volumes for 1894, 1895, and 1896.
The Academy.

JALAPA.—Boletin Mensual Meteorologico del Observatorio Central del Estado de Vera Cruz, May-October, 1897. *The Director.*

LAUSANNE.—Bulletin de la Société Vaudoise des Sciences Naturelles. Series 4, vol. 33, nos. 123—126, 1897.
The Society.

LAWRENCE.—The Kansas University Quarterly. Vol. 1, nos. 1, 3, and 4; volumes 2, 3, and 4 complete; vol. 5, nos. 1 and 2; and vol. 6 complete, 1892-97.
The Kansas University.

LEIPSIC.—Sitzungberichte der Naturforschenden Gesellschaft zu Leipzig, 22nd and 23rd years, 1895-96.
The Society.

LONDON.—Quarterly Journal of the Geological Society of London, vol. 43, parts 2 and 3, 1897, and vol. 44, part 1, 1898. Also General Index, part 2, 1897, and Catalogue of Geological Literature added to the library during 1897.
The Society.

Journal of the Royal Microscopical Society. Parts 1—6, 1897. *The Society.*

Transactions of the Zoological Society of London. Vol. 14, part 4, 1897; and part 5, 1898. Proceedings. Parts 1—4, 1897; and List of Fellows, 1897. *The Society.*

Report of the British Association. Toronto Meeting, 1897. *The Association.*

MADRAS.—Bulletin of Madras Government Museum. Vol. 2, no. 1. 1897. Administration Report for 1896-1897. *The Superintendent.*

MANCHESTER.—Journal of the Manchester Geographical Society. Vol. 12, nos. 4—12, 1896; and vol. 13, nos. 1—6, 1897. *The Society.*

Transactions of Manchester Geological Society. Vol. 25, parts 7—11, 1897; and parts 12—14, 1898. *The Society.*

MARSEILLES.—Annales de la Faculte des Sciences de Marseille. Vol. 6, fasc. 4—6; and vol. 8, fasc. 1—3, 1897-98. *The Librarian.*

MELBOURNE.—Proceedings of the Royal Society of Victoria, New series, vol. 9, 1897; and vol 10, part 1. 1897. *The Society.*

MEXICO.—Anuario, del Observatorio Astronomico Nacional de Tacubaya, ano. 18, 1897; and Boletin no. 2, nos. 1 & 2, 1897. *The Director.*

Boletin Mensual del Observatorio Meteorolgico Central de Mexico, Feb.-Dec., 1897. Also Resumes Mensuales, 1891-92. *The Director.*

Informes y Documentos Relativos a Comercio Interior y Exterior. Nos. 2—5, 1885; and no. 17, 1886. *The Department.*

MILWAUKEE.—Fourteenth Annual Report of Milwaukee Public Museum, 1897. *The Trustees.*

MOSCOW.—Bulletin of the Imperial Society of Naturalists of Moscou. No. 4, 1896; and nos. 1 and 2, 1897. *The Society.*

NANTES.—Bulletin de la Société des Sciences Naturelles de l' Ouest de France. Vol. 6, part 4, 1896; and vol. 7, parts 1—3, 1897. *The Society.*

NEW YORK.—Annals of the New York Academy of Sciences. Vol. 9. nos. 4—12, 1897. Transactions. Vol. 15, 1896. *The Academy.*

Bulletin of the American Geographical Society, Vol. 29, nos. 1—4, 1897; and vol. 30, no. 1, 1898. *The Society.*

Odessa.—Memoirs of the Society of Naturalists of New Russia. Vol. 20, part 2, 1896; and vol. 21, part 1, 1897. *The Society.*

Oporto.—Annaes de Sciencias Naturaes. Vol. 4, nos. 2—4, 1897. *The Editor.*

Osnabruck.–Eleventh Jahresbericht des Naturwissenschaftlichen Vereins zu Osnabruck, 1897. *The Society.*

Ottawa.—Annual Report of the Geological Survey of Canada. Vol. 8; and Maps 585—588, 1895. Also Palæozoic Fossils. Vol. 3, part 3, 1897. *The Director.*

Padua.—Atti della Società Veneto-Trentina di Scienze Naturali. Series 2, vol. 3, fasc. 1, 1897. *The Society.*

Philadelphia.—Proceedings of the Academy of Natural Sciences of Philadelphia. Parts 1—3, 1897. *The Academy.*

Proceedings of the American Philosophical Society. Nos. 153 and 156, 1897. *The Society.*

Pisa.—Atti della Società Toscana di Scienze Naturali, Processi verbali. March—July, 1897. *The Society.*

Rome.—Atti della Reale Accademia dei Lincei. Series 5, vol. 6, semestre 1, fasc. 8—12, 1897; semestre 2, fasc. 1—12, 1897; and vol. 7, semestre 1, fasc. 1—7, 1898. Also Rendiconto dell' adunanza solenne del 5 Giugno, 1897. *The Academy.*

Bulletino della Società Romana per gli studi Zoologici. Vol. 6, fasc. 1 and 2, 1897. *The Society.*

Rivista Italiana di Sociologia. Anno 1, fasc. 1 and 2, 1897. *The Editor.*

San Francisco.—Proceedings of the California Academy of Sciences. Series 2, vol. 6, 1896; series 3,

Geology, vol. 1, nos. 1—3, and Zoology, vol. 1, nos. 1—5, 1897. Also Occasional Papers, no. 5, 1897. *The Academy.*

St. Louis.—Eighth Annual Report of Missouri Botanical Garden, 1897. *The Director.*

Stavanger.—Stavanger Museums Aarsberetning for 1896. *The Museum Trustees.*

Stirling.—Transactions of Stirling Natural History and Archæological Society, 1897. *The Society.*

Stockholm.—Kongliga Svenska Vetenskaps Akademiens Hand lingar. Vol. 28, 1895, and vol. 29. 1896. Bihang, vol. 22, parts 1—4, and Ofversigt, no. 53, 1896-97. *The Academy.*

Tokio.—Mitheilungen der Deutschen Gesellschaft für Natur und Volkerunde Ostasiens in Tokio. Vol. 6, part 59, and Supplements 1 and 2, 1897. *The Society.*

Toronto.—Proceedings of the Canadian Institute. New series, vol. 1, part 1, 1897. *The Institute.*

Upsala.—Bulletin of the Geological Institution of the University of Upsala. Vol. 3, part 1, No. 5, 1897. *The University.*

Vienna.—Verhandlungen der Kaiserlich Koniglichen Geologischen Reichsanstalt. Nos. 6—18, 1897, and nos. 1 and 2, 1898. *The Society.*

Verhandlungen der Kaiserlich Koniglichen Zoologisch-Botanischen Gesellschaft. Vol. 47, 1897. *The Society.*

Washington.—Department of Agriculture. Year Book, 1896; Farmers' Bulletin, no. 54. 1897; and North American Fauna, no. 13, 1897. *The Secretary of Agriculture.*

Bureau of Ethnology. Fourteenth Annual Report, part 1, 1896; Fifteenth Annual Report, 1897; and Sixteenth Annual Report, 1897.
The Director of the Bureau.

United States Geological Survey. Seventeenth Annual Report, parts 1 and 2, 1896. Monographs, vol. 25, 1896; vol. 26, 1895; vol. 27, 1896; vol. 28, 1897, and Atlas. Bulletins, no. 87, 1897; nos. 119 and 120, 1894; nos 127 and 130, 1896. Also nos. 135—148, 1896.
The Director.

American Historical Association. Annual Report for 1895. *The Association.*

United States' National Museum. Proceedings, vol. 18, 1895. Annual Report for year 1894. Also Bulletin, no. 47. Fishes of North America, 1896; and no. 49, Bibliography, 1896. Annual Report of the Smithsonian Institution, 1895. Contributions to Knowledge, no. 1,034, 1896. Miscellaneous Collections, no. 856, 1893; nos. 1,035, 1,038, 1,039, 1,071, 1,072, 1073, 1896; and nos. 1,075, 1,077, 1,084, 1897. The Smithsonian Institution, History of its First Half Century, 1897.
The Smithsonian Institution.

YORK.—Annual Reports of the Yorkshire Philosophical Society for years 1890-97. *The Society.*

ZURICH.—Vierteljahrsschrift der Naturforschenden Gesellschaft in Zurich, 42nd year, parts 1 and 2, 1897; and parts 3 and 4, 1898. Also Neujahrsblatt, 1898.
The Society.

From Miss MACKAY.—Buffon's Natural History, 2 vols., 1821.

From Robert Lloyd Patterson, Esq., J.P., F.L.S.—Journal of the Linnean Society, Botany, vol. 33, nos. 228—230, 1897 and 231, 1898.

From R. M. Young, Esq., B.A., J.P., M.R.I.A.—Manuscript Common Place Book of the late James M'Adam, Esq., F.G.S.

From Thomas G. Fleming, Esq., F.G.S.—O'Halloran's History of Ireland, 3 vols. 1803; also six other volumes.

BELFAST

NATURAL HISTORY & PHILOSOPHICAL SOCIETY.

SESSION 1898-99.

INDUSTRIAL TRAINING AND TECHNICAL EDUCATION:

A Paper read 9th November, 1897, before the Belfast Natural History and Philosophical Society,

BY MAJOR-GENERAL GEARY, C.B.

PROFESSOR J. D. EVERETT, D.C.L., F.R.S., President, in the Chair.

MR. PRESIDENT, LADIES AND GENTLEMEN,—My friend Mr. Lloyd Patterson will tell you that when he first conveyed to me your kind invitation to lecture to this Society I received his proposal with a feeling akin to dismay. It hardly seemed possible to me to tell you anything which could be interesting to so learned and intelligent an audience. I can only lay claim to having endeavoured to keep myself in some small degree abreast of the progress of the age, and to submit with the greatest deference for your consideration some matters which seem to me not unworthy of deeper thought than in the rapid progress of discovery they are apt to receive.

Some 25 years ago, returning to England after a long sojourn in India, I was struck with the difference between the condition of the labouring classes at home and in India; and observed that, with all their poverty, substantially the contrast was favourable to the Indians. There was more contentment, more cleanliness and sobriety and less brutality amongst them. The very distinctions of caste implied that everyone had a definite calling of some sort—the calling was not always very remunerative—but except in times of distress, of war or famine, and eliminating professional beggars, all managed to get a livelihood, it being remembered that in India this means very little. It struck me, as I became more intimately acquainted with them, that the English paupers were poor and wretched and degraded

because they had never received any definite training, and that this truth had never permeated the brains of English legislators or, if so, had received little support. I had the good fortune to know the late Sir Edwin Chadwick in England, and afterwards the late Sir John Lentaigne in Ireland, and through them learned the justice of my conclusions. I then visited the greater part of the Industrial Schools and Reformatories in the United Kingdom, besides a large number of the ordinary elementary and workhouse schools, and studied the returns and results. I found that the percentage of those who went to the good from institutions in which trades and industries were taught largely exceeded in proportion all other elementary schools; for instance, boys thoroughly well taught, as they teach at Artane near Dublin, commanded wages on discharge varying from £1 to £3 per week.

In some Institutions the boys were only taught industries which would produce money for their support while in the Institution, and were of no direct use to them on discharge, except, and please mark this, that it taught habits of industry and the consciousness that if a man will not work neither shall he eat. The same experiment was tried amongst enlisted boys in the army, and it was found that a boy taught to be a saddler or tailor or carpenter soon became a non-commissioned Officer and artificer, and was eventually discharged with a good pension and trade at his back; whereas the man who had not been taught any special industry, was on discharge, in comparison nowhere. These views were pressed with a weight of evidence before a Commission ordered by Lord Cranbrook when Secretary for War, but very limited results came of it for reasons it is unnecessary to dilate upon here. Sufficient to say that they in no way controverted the conclusion arrived at. Being then younger and more sanguine, I looked to the Elementary Education Act to inaugurate a system more breadwinning in its effects than that which prevailed—and does unfortunately prevail still—but with all the pressure that could then be brought to bear our hopes were doomed to disappointment. The Government of the day, like

all popular Governments, was opportunist. It would not face the ratepayer by asking him to pay for industrial teaching, and succumbed to the growl from the gizzard wing of Trades Unionism.

It is a remarkable fact in considering this question that the Government supports Reformatories for boys and girls convicted by Magistrates, and Industrial Schools for neglected children, the peculiar feature of these Institutions being the teaching of trades and industries, while the same is denied to the children of honest parents. A large number of voluntary institutions have also been provided by private enterprise to meet similar cases which do not exactly fulfil the Government requirements as regards age and minor details. Industrial training is in fact the predominant feature of all preventive institutions. What can be more illogical than for the State to wait for an adult or child to fail in some respect before he or she can qualify for the benefit of a bread earning education or training? All education can only be regarded as "preventive," and some would therefore suppose the wisest and most economical proceeding be, to provide this more suitable education before the individual is brought to the brink of destruction. Surely the children of honest folk, whom the National conscience has decided shall be educated in our Elementary schools, are entitled to find there a system equal to that which is recognized by the Government as suitable for building up into industrious, well conducted citizens the neglected children of the lowest classes of the community. A reference to the publications of that most excellent Society the Refuge and Reformatory Union will give some idea of the amount of Industrial training which is going on quietly and unostentatiously in the various Preventive Institutes partly supported by the State and part by voluntary effort.

There are in the United Kingdom 1070 Institutions, of which about 700 are Industrial Institutions for the young, and they accommodate 71,185 individuals, of which about 61,000 are still in their youth. In these Institutions 86 different trades are taught, exclusive of the ordinary domestic work of the homes;

washing and plain needlework are taught in all girls' homes. In many Institutions steam power is used, and the inmates are in such cases taught the care and management of engines and machinery. Considering the antecedents of so many of the inmates it is evident that a proportion will have been unable to acquire any proficiency in trades when discharged, but all will have acquired habits of work and industry and that power of restraint and self discipline which industrial training involves. On the other hand some will develope far above the average, and qualify themselves for higher pursuits. I remember a young man employed by the late Sir Bernard Burke, engaged in doing heraldic work in his office, whom he had taken from an Industrial school, and I suppose there are few of these Institutions that cannot adduce similar instances. I mention this as an answer to those who despise industrial work as cramping to the soaring genius of the modern school boy, whose chief desire is to wear a black coat and keep his hands clean.

I alluded just now to those who are unable to acquire proficiency in any trade. The care of these and their development point to the important bearing of sanitation and physical training on industrial training, as the strength both of mind and body to work must be obtained and preserved. Cleanliness comes first; clean bodies, clean clothes, clean hair and clean food; next, sufficient drill has been introduced generally as necessary to the orderly work of an institution, carrying with it, insensibly amongst the pupils, habits of smartness, self-respect and obedience. This may also be seen in the various Boys' Brigades. It is estimated that of the children who enter these Institutions free from disease the death rate is about 3 per 1000, which is about one-fourth that of those outside. Children's diseases are almost banished—and about 90 per cent. are got into good productive service and keep it.

The jealousy with which our Industrial Schools and Reformatories are regarded by tradesmen outside is very much to be regretted, as it restrains managers of these Institutions from doing their best to turn out lads efficient in remunerative trades, and confines them to teaching industries which can

never be directly useful to the lads on discharge. These Institutions ought to be expected and encouraged to turn out thoroughly instructed and well behaved lads ; when they fail to do this, it must be due either to inefficient management or to want of funds. The Government grant is sufficient for maintenance, but the liberality of the public has to supply the plant necessary for efficient teaching and for high class supervision. It would perhaps reconcile the objectors to the slight competition of these schools if arrangements could be made for the Institutions to supply goods to the trade and leave the trade to deal with the public. As these are the only schools in which industries are taught, it is in the interest of all that they should be models of efficiency, if only to shew the injustice of not extending the same system to the honest poor.

There is a proverb, in the Talmud I believe as well as in the Vedas, that he who fails to teach his son a trade teaches him to be a thief. Thus, taking the best Industrial Schools, you find the son of disreputable parents, who have cost the public considerable sums either as paupers or prisoners, discharged with a trade, which, if well conducted, will ensure him an honest livelihood; while, on the other hand, the poorly fed son of an honest working man will be discharged from his elementary school having achieved the standards necessary for the Education department, but which is almost useless to him for carrying his mother's milk pails, or in running errands for three or four shillings per week. Is it an exaggeration to say that starting thus, the probability is that the son of the honest working man will at last have to serve the son of the "ne'er do weel"?

On visiting an elementary school after the third hour who has not been struck with the listless, vacant look, or with the idling of the pupils? Is it reasonable to expect five hours consecutive mental work from badly housed, badly fed children? It has been proved *ad nauseam* that the boys in a school, worked on the half time system of half school work and half industry, will attain a given educational standard as quickly as the full timers and often sooner. What I plead for is that the

child of the honest working man shall be given as advantageous a start in life as the son of the felon, not by levelling the education of the latter down but by raising the other. Be it remembered that when the man without a special trade or calling has deteriorated in his personal appearance from sickness or misfortune, the difficulty in raising himself again is almost insuperable ; whilst the dissolute tinker, who is only sober for three or four days in the week, can always earn a livelihood, and does not become chargeable to the ratepayer, at all events not as a pauper.

Now, gentlemen, let us consider the objections to be met in face of the conclusions I have indicated.

Firstly—Industrial, like technical, training involves money and expense to the ratepayers or to the Government.

Secondly—Such training, if extended, would be violently opposed by Trades Unions.

Thirdly—No opportunist Government would encounter the opposition of these interests unless pressed by the electorate.

Fourthly—Such a reform would be opposed by those educationalists, who, whilst the poor are crying for bread, offer them the stone of higher education.

As regards the first, the increased outlay would be more than repaid by the reduction in the expense of poor relief and punishment of criminals. The cost of every unemployed man by the state, is estimated at an average of £400 for his life. As regards the second, the time must come, if the country is to remain prosperous, when the tyrannical excesses of Trades Unionism will have to be restrained. At the present moment terrorism is used to prevent free labour and freedom of contract between employers and employed ; and regulations are made in order to limit the numbers engaged in a particular trade, and to limit the productiveness of the owner's machinery.

Not long ago I went to enquire in a very considerable town in England if some soldiers could be sent to attend the Technical classes of their trades, and I was told that no one was allowed to attend who was not a member of a Trades Union. I asked if a young man who had learned his trade thoroughly

in an Industrial Institution might attend; and they said no, unless he chose to join a Trades Union. This was a class paid for by the Municipality out of tne 6d tax on beer.

It is because I am in sympathy with the better side of Trades Unionism that I am ready to denounce the other as inimical to the welfare of the masses and consequently to the best interests of the State. One can not help a smile like the Roman Augur's, at our vaunted "pax Britannica" abroad, knowing that the law fails to protect its citizens in the exercise of their right to earn their daily bread at home.

As regards the third point, the government of the day, of whichever party, will not move unless impelled by public opinion; it is for us, upon whom the pressure of maintaining hopeless pauperism falls, to make ourselves heard on the subject. And, fourthly, the educationalist pure and simple does not concern himself about pauperism. He, naturally, wishes to raise the general level of education, too often forgetful of the fact that to live is a man's first object, and, afterwards, to raise himself by education.

What can be more absurd, were it not too sad, than the up-bringing of the workhouse boy in an unreformed workhouse school; bred a pauper, taught within the workhouse walls, surrounded by every evidence of his condition, trained to no industry worthy of the name, he starts in life with only a little elementary education. His earnings are of the smallest, he has neither stamina nor training for earning a livelihood. He looks upon the Union as his home, returns there at intervals, perhaps marries a girl similarly reared, and his promising offspring succeed him too often in the same career. I maintain we have, and shall have a pauper population so long as we neglect to teach the young some industry by which they may earn a livelihood.

Fortunately, trade depression and Industrial Exhibitions have at last roused the country to the want of technical education; and politicians, who have allowed a golden opportunity to slide, now lecture and harangue as if they had been friendly to the movement all their lives. Happily the work has now

been taken up in earnest, but not in what I conceive to be a spirit of thoroughness, and not so much in the interests of those who most require help as in those of the lower middle class and members of Trades Unions; and the necessary connection between Industrial Training and Technical Education, the former leading up to the latter, has to a great extent been lost sight of.

It is noticeable in reading reports of the Technical Schools which are doing excellent work, the small numbers in proportion to the population who avail themselves of these advantages. I read in the last report of the Belfast Technical School that in the weaving class out of 37 enrolled in 1895 only half a dozen returned in 1896. In the carpentry and plumbing schools the Committee say, "After several years experience it is evident beyond doubt that the lads attending them are, generally speaking, very imperfectly prepared to enter upon technical training with any satisfaction to the teachers or the possibility of obtaining the benefits which ought to be realized." The aggregate numbers who were examined and passed are respectively 56 and 30, deplorable for an industrial population of over a quarter of a million. It seems then essential to the success of technical teaching that there should be more candidates and that they should be better prepared; and that this difficulty can only be overcome by a previous industrial training such as I am advocating. Technical education is now admittedly an urgent necessity if we are as a nation to maintain our commercial position; but the education of the few will not suffice. We must seek to raise the standard of the whole. Begin with the industrial training of the young and the technical classes will be filled. I do not venture to suggest a hard and fast rule as to what means should be employed to bring home industrial education to the poor. Some may advocate the workshop and others special schools—the means will vary in different places—but, given the will to do it, the best means will be easily found. This only partial success of the Technical classes is an apt condemnation of the policy of the trades unionist in desiring to limit the workers in any particular trade, and it points to the injury being done to the trade of the country.

It is very desirable that the workmen should be brought to consider the unwisdom of their conservative policy. The command of the markets of the world must eventually fall to the best work, which will be turned out by the best workmen. Increased numbers of skilled workmen will increase superior production and drive out inferior articles: moreover skill will be constantly increasing by competition for higher wages and the command of markets. It is a matter of notoriety that our colonies and greater Britain generally are calling for skilled workmen, and a really good English workman may find ready employment in continental Europe. There is no danger of trades being overmanned. Limiting production and keeping skill down to a low average mean a loss of the world's markets in the not very distant future.

Again, there is indefensible opposition to the introduction of labour saving machinery. It is well known that the manufacture and up-keep of such machines directly and indirectly employ more men than they displace, whilst they lead to extension of enterprise and render the employers more independent of the supply of unskilled labour. If the working man had only a Kingsley to listen to instead of a salaried demagogue we should see him anxious to place the best work that skill and industry could produce in the market, and realizing that commerce, as well as arms, has its triumphs. Instead of this we have the policy of a troglodyte—to limit production, to keep skill and good work down to the lowest possible point, and to brutally prevent any man acting independently, ever striving to prove his doctrine orthodox

"By (un) Apostolic blows and knocks."

A deputation from the Technical Instruction Committee of the City of Manchester visited the Technical Schools, Institutions, and Museums of Germany and Austria in July and August of the present year, and has lost no time in issuing a most interesting report. A great part is taken up by describing the liberal scale upon which these institutions are fitted up and staffed with instructors; but I propose only to touch upon a few points which seem to bear more especially upon our present

subject, and this I shall do as nearly as possible in the words of the report.

Perhaps two of the most interesting are that the education and training of the young is so efficient as to enable them to enter these classes of technical instruction at the age of 14 (it being remembered that in Germany all children are taught an industry as a general rule), and the tendency for the schools to develope into commercial undertakings in which investigation of the best methods and instruction go hand in hand with production. The schools of Crefeld, Aix la Chapelle and Berlin are especially noteworthy and have given Germany her pre-eminence in the textile and woollen articles produced by them. It is said that from the last of these institutions, of mantles alone, £1,000,000 worth are annually exported to this country. At Darmstadt, a most important school exists for instruction in Electro-Chemistry and Electrical Engineering; and amongst the 1,000 day students are to be found a large number from various European countries. The comparatively advanced age of the students in German Technical Schools is especially remarkable, and without doubt the general industry of the country gains by the extended time given to scientific technical training in the supply of a large number of adequately educated men. Nothing is more striking than the prevision of those responsible for the education of the Germans and Swiss people in providing the means for the best possible training in chemical science and its industrial applications. The success of their policy may be realised from the fact that the great colour manufacturing works on the Rhine alone employ 5,000 men and upwards of 100 scientifically trained chemists. These works are but one of several on a similarly large scale. The value of the world's markets in colouring matters and pharmaceutical products is estimated at ten millions sterling, and of this, 75 per cent. is in the hands of Germany. In most of the towns fine Industrial Art Museums have been established with the purpose of cultivating a knowledge of what has been accomplished, in the production of examples of colour, design, and workmanship. Every technical school has

its special museum of objects appliable to its purposes, nor are the local authorities slow to avail themselves of these Institutions, for we find at Nuremburg that the Town Council avail themselves of the advice of the Professor of Architecture and entrust to him the duty of seeing that any modern buildings proposed for erection shall harmonize with the old. Every encouragement is given by the employers to their workpeople to attend these schools. Perhaps there is nothing so deserving of the attention of English firms as the strenuous efforts being made in Germany and Switzerland to develope their great engineering industries with the evident object of displacing us in the markets. The deputation referred to also reports a visit to the Museum of Hygiene in Vienna, with its appliances for securing health in the dwellings, workshops and factories. This cannot fail to be both interesting and instructive to the citizens of a town boasting the highest death rate in the United Kingdom. It appears that our rivals the Germans have a complete and well organized system of industrial and technical teaching without a break from childhood upwards, and that experimenting and learning are never put aside as done with. Every new method is not only tried practically but subjected to a commercial test, and then introduced or discarded as the case may be. Under their system and under ours the question of colonial extension and foreign markets does not require to be fought out by armies and fleets, the battle is being fought out, whilst we are speaking, at home; and if Germany captures department after department in our home markets, as she has in colouring matters and pharmaceutical products, the rest must follow as a matter of course. The loss we have already sustained is pecuniarily more than equivalent to the loss of much of that territory which in our pride we call Greater Britain, and spend so much annually in money and men's lives to maintain. The value of colonial extension will be very much reduced if the expense is to be ours and the commerce Germany's or some other Power's. Not that I am advocating protecting tariffs; on the contrary let us keep open markets; but let us be wise enough to keep them by good work and commercial intelligence.

There seems to me every reason why the subject of education for the people should be taken up on definite lines without delay. As the child is father of the man, so the education of the child should lead up to that of the adult. Were it resolved upon, though we have lost the start, it would not now be too late with our superior natural and financial resources to regain some of our lost ground.

The financial aspect of the question calls for some remark. The establishment and progress of these schools and museums is due entirely to Government initiative, and they are maintained at Government expense. They could not be supported without it. It depends upon the point of view from which the question is regarded whether it be considered as a legitimate tax upon the nation at large or as a bounty given to foster certain industries. I am inclined to agree with the Manchester Committee who consider that the work to be done requires Government control to fix where the schools shall be placed, to appoint competent instructors, and to keep the Museums constantly supplied with the newest appliances and examples. Much as we may be in favour of decentralization we must confess that local bodies have neither time nor knowledge to deal with so important a national work, as it is entirely foreign to the subjects with which they are in the habit of dealing. Money granted for these purposes should be from Imperial funds, as it would be most unequal and unfair to raise them by local taxation. There are public bodies existing, such as omniverous South Kensington or the Colonial Institute, which, with a little change of personnel, might be entrusted with a national scheme.

I wish, gentlemen, at the risk of some little repetition, to press upon you not only that the present Elementary schools fail to give a bread-winning education suitable to the requirements of the poor, but that their system is directly opposed to the teaching and experience of the last 30 years in favour of Industrial training. For teaching to be successful, the pupils must be physically capable of sustaining their attention. A child cannot be physically fit without health, and health can

only be preserved by sanitary conditions ; so long as children are reared in houses in which all sanitation is neglected they will, with difficulty only, be taught anything. The "mens sana in corpore sano" is a first condition. If you will visit the poorer elementary schools in this city you will find an aggregation of children with dirty clothes and dirty skins, striving, or more correctly not striving, in a dirty atmosphere, to take in five or six hours mental instruction. During the last two and a half hours there is a total absence of receptivity. The scene in the street as they scatter homewards shows how little they are used to control or discipline. Every boy I have examined in the Balmoral Reformatory was a pupil in an elementary school. It is said that the modern epidemics of smallpox and such like diseases were unknown among the heathen until the missionaries, in their ignorance of sanitary science, assembled the unwashed savages in churches and congregations ; and it may be suspected that the epidemics of measles, scarlatina, and other children's diseases in this city are largely due to the conditions thus described. During the last great epidemic of Cholera in London and which raged in the East end, in a large half time school in the very midst in which sanitary measures were duly observed, not one instance occurred amongst the inmates. Remembering, too, how indifferently many of these children are fed, can any reasonable man expect them, when they leave school, with all these additional drawbacks, to be fit to earn an honest livelihood ?

Contrast with these what has been proved on the other side in half-time schools with industrial training. Masters have reported for thirty years that the half-timers will reach a given standard in the same or even less time than a full timer, for the simple reason that for half-time the child's brain is fresh and receptive, and after a longer period it flags. All that is learned and assimilated in either school is acquired during that time. On the other hand the half time spent in labour is remunerative, and therefore fair to the parents as well as agreeable to the child, who is at the same time learning not only what will enable him to earn his bread, but habits of order, discipline

and steady work, and that invaluable training of accustoming the eye and the hand to work together.

The sanitary requirements are the same in both cases; but at the worst the half-timer escapes from his dirty companions and dirty school room atmosphere in half the time. In places where there is an active and educated public opinion dirty children in dirty school rooms have ceased to be tolerated. A lavatory at the entrance is not very expensive.

Statistics have not only shewn what I have stated, but the proportion of crime is strikingly favourable to the half-time schools. Having brought the children so far on passing through the school standards, they would be eager and ripe to attend continuation schools or classes to fit them to join the Technical classes so as to benefit more fully by their teaching, and it is thought that the present want of numbers would speedily be changed to an overflow.

I have ventured to bring before you at perhaps some length the working of Industrial Institutions in order to show what has been achieved, and that their success justifies the public expenditure upon them. But I might expose myself to the reproach of being a visionary and a mere theorist were I to refrain from suggesting how the Industrial system could be applied in connection with elementary schools outside, having due regard to economy as well as efficiency. First of all, as the pupils would be divided into two divisions the accommodation for school classes might be reduced by one half, while sheds or light buildings would require to be built as workshops. Part of the teaching staff could be reduced and labour instructors employed in their stead. The children should be made to attend school clean both in clothes and person. In poor schools a lavatory should be provided and children made to wash before associating together. Thorough ventilation is indispensible. Children should be frequently inspected and any child found with any infectious complaint should be sent home and the house in which it lived dealt with by a Health Officer.

The proceeds of the children's industry should be divided

proportionally between the school authorities and the children themselves. In schools, belonging to which the pupils worked in factories, &c., the workshop accommodation would be unnecessary. Girls should be taught plain needlework, washing, cooking, and certain simple rules as to domestic sanitation. I have seen the younger boys usefully taught knitting as well as netting. It keeps the fingers pliable, necessitates attention and consequent interest, and accustoms the hand and eye to work together. As in institutions the success is largely due to the sanitary arrangements so it is necessary not only to ensure the sanitation of the school premises, but the houses in which the children live.

An Englishman's or Irishman's house may be his castle; but it is intolerable that it should be a menace to the health of his neighbours. Dirty walls, dirty floor and dirty ceilings harbour disease, and any system but that of the removal of all excreta and household slops, except by a constant water supply and perfect drainage, is intolerable in civilized cities. Sanitary science may be summed up in a few words—free circulation of air and water. For what purpose do city or town public functionaries imagine they exist, unless it be pre-eminently for ensuring the safety of the inhabitants, not only from violence but also from sickness. It is that low state of health which unfits them for the support of wives and families, destroys their children, and drives them in despair to the demon of drink and to an early grave.

Although few people are sufficiently attentive students of history to draw lessons therefrom for present guidance, there is one which may be germane to our present subject. The embarassment of Athens, and the decline and fall and subsequent degradation of Rome, were due to the rabble of paupers dependent on the public bounty. Look again at the facts of the several French revolutions. Do not all teach us the danger to the community of a hungry, untrained, idle population? On the other hand, contrast the contentment of the industrious peasantry of Switzerland and France. Perhaps the most sad and really wholesome lesson for ourselves is to be drawn from

the action of the ignorant, selfish government of our forefathers, which, killing the nascent industries of Ireland, left to their descendants a legacy of rebellion, hatred and discontent. For Ireland a better method of Education on Industrial lines is of the utmost need, so large a proportion of the people requiring to be born again to habits of bread-winning industry. Imperfectly as this has been tried, one cannot help contrasting the different conditions of the North and South of Ireland, due in a very great measure to the half time schools in connection with the factories. I was told by the owner of one of the largest mills in the North of Ireland that his best hands had been entered when half-timers. It is in the power of Poor Law Guardians to apply this system in the workhouses and it has for many years been adopted in the Union District Schools of London ; nor do I think that any one who wishes to earn the blessing promised to him who considers the poor can do better than help to improve their sanitary condition and to give them the means of earning an honest livelihood.

In this paper I have avoided the introduction of statistics both from the difficulty of attaining correctness up to date, and the consciousness that figures can be arranged to prove anything. I have confined myself to general results in the hope of leading some who have influence in their generation to follow the subject up to practical results ; for it is impossible that the labors and aspirations of so many great and unselfish men who have written and striven to help forward the cause of Industrial Training for the poor, shall for ever be defeated by the degrading selfishness of a small section of the community, or by the supineness of party politicians who may happen to be in temporary power.

Nor have I, gentlemen, been so unmindful of your patience as to leave insufficient time for any discussion which may ensue.

Mr. R. LLOYD PATTERSON proposed a vote of thanks to General Geary.

Dr. R. KYLE KNOX in seconding the motion pointed out that theteaching of trades, which seemed to be General Geary's view, was not his idea of the province of a technical school, which he held should attempt merely to teach the scientific side of those crafts which could only be properly acquired in the workshops or factory. He also disagreed with General Geary's assumption that the workmen of Belfast were as a class badly housed and surrounded by dirt in their dwellings.

Mr. M'MANUS (Belfast Trades Council) challenged General Geary's statement that trades unionism was opposed to technical education. On the contrary, it was strongly in favour of it, and was at present engaged in demanding it at the hands of the Corporation.

Professor FITZGERALD agreed with the lecturer that industrial training in schools was calculated to have the best effect on both the minds and bodies of the pupils. With regard to technical education he had not found that, in Belfast at any rate, any difficulties arose with trades unions ; on the contrary, the trades favoured such education. With regard to industrial training in schools, it was not to be confounded with what was called manual training, such as the system known as Sloyd, and other analogous systems, which are not intended to teach any industrial art directly, but only to develop the faculties both of mind and body of the scholars. Industrial training went beyond this, and aimed at directly cultivating special dexterities and faculties, useful in particular trades. It was therefore not suitable for all classes of schools, or scholars, nor was it suitable for all trades. It was most especially fitted for the development of what are often called cottage industries, and its most useful application was therefore in places and among people where it was desirable to create or encourage these.

Dr. BEATTIE, Dr. SHELDON, and Mr. T. FOSTER also spoke in friendly criticism of the lecture.

Mr. Conway Scott, who was called on by the President, said he did not intend to enter into a discussion of sanitary matters in connection with a lecture on technical education. General Geary, however, seemed to allow his animosity to the Belfast Corporation to come into everything he did. In the scheme of industrial education he had unfolded he had allowed his militarism to become too prominent. Although he disagreed with the lecturer in the assumption that the free people of Ireland would allow their children to be treated in a school in exactly the same way as the children of criminals were treated in an institution, he agreed with him in the proposition that the children of criminals should not get a better start in life than the children of honest men. According to General Geary, Belfast was really a miserable place. It was dirty, unsanitary, had no elementary education worth speaking of, and no technical education at all. Yet, in spite of all this, they found pupils from some of the Belfast elementary schools taking prizes and sizarships at the English Universities; they found the city increasing with marvellous rapidity in wealth and commerce and population; and they found its people, in spite of the want of technical education, able to build the best ships and make the best linen goods in the world. There seemed a tendency on the part of some of those who lived in Belfast to malign themselves, and certainly that tendency had been given full rein to that evening. He thought of all technical education in Ireland agricultural education was most necessary, though this had not been mentioned by the lecturer.

Mr. S. F. Milligan spoke in terms of high praise of the lecture, as did also Mr. J. H. Greenhill, Mr. W. Gray, and the President.

The vote of thanks was passed with acclamation, and after duly acknowledgment,

General Geary said—In reply to the criticisms so kindly offered I beg to remark that I entirely accept the distinction made by Dr. Kyle Knox as regards industrial and technical training.

I am glad to hear that trades unions in this city are in favour of technical training. My observation has been, that this sentiment is general ; but I am aware of instances where it has been sought to make technical education conditional upon membership of a trades union. This is what I demur to. I have always been in favour of the principle of trades unionism, and for that very reason have been opposed to its excrescences and perversion of its legitimate objects.

I do not agree with Mr. Scott's statement as regards my attitude towards the Belfast Corporation. My object has been, ever since I have been here, to support them and strengthen their hands, for which I have received many acknowledgements from the chief magistrates. It is a curious argument against a more useful kind of elementary education to say that Belfast has turned out some able men, and a still more remarkable argument in depreciation of a high rate of typhoid and preventable disease to say that Belfast builds big ships and is celebrated for its linen manufactures. It may be that the evils I have alluded to and the successes Mr. Scott refers to are not wholly unconnected. It rather reminds one of Lord Macaulay's summary of the character of Charles I. In this, I am quite sure, we shall all agree, that the co existence of evil and good are quite possible, but it affords no possible reason for neglecting to remedy the evil.

7th December, 1898

Professor J. D. Everett, F.R.S., President, in the Chair.

ABNORMAL IDEAS AND NERVOUS SUPER-EXCITABILITY.

By John M. MacCormac, M.D., L.R.C.P. & S., Ed.

(*Abstract.*)

That the phenomena of innervation are intimately associated with and dependent upon ideas, which arise in the mind, must be evident to every thoughtful observer, and the object of this paper is to determine to what extent some types of nervous disorders are due to morbid or vicious sentiments. Though the investigation of it must of necessity be of a technical nature, the conclusions cannot fail to possess an absorbing interest to the intelligent student.

The points which may be usefully examined are :—

(1) The troubles of the nervous system which are associated with the absence of any real purpose in life.

(2) Those which are associated with materialistic teaching.

(3) Those which are associated with mystical teaching.

(4) Those which are associated with civilization in its vaguest form.

1. We cannot fail to see that the destiny of man is to act with energy, will, and intelligence. The external world and his own mental powers urge him to action, but the determining power is his will. The best classification of mankind is that based upon the possession or non-possession of an intelligent purpose. The character of the purpose reveals the character

of the man, but the absence of a purpose underlies diseases, and more especially those of the nervous system to such an extent as to frequently predispose to madness. An American writer has said "The most pitiable sight one ever sees is a young man doing nothing; the furies early drag him to his doom." Absence of purpose is condemned from a moral point of view. It is also condemned from a hygienic point of view. Watch the symptoms of those who voluntarily shrink from an aim in life. Agitated and restless, they wander here and there, in the vain hope to escape from self. Victims of mental disquiet, they rush into excitement, only to revert to an aggravated form of their malady, and the outcome is felt in hypochondria, distorted ideas, mystical aspirations, which in their turn produce rage, envy, remorse, anxiety, despair.

A celebrated French physician instances, on this point, a case of hypochondria engendered by luxury and idleness. The patient aimed at getting, by the aid of his riches, the utmost pleasure out of life with the least possible amount of trouble. To avoid the duties of parent, he would not marry ; he invested his money, so that the income might be realised without trouble; he lived at a restaurant, to be freed from the duties of a home ; he would not travel because of the consequent fatigue ; he never walked when he could ride; he clothed himself unnecessarily in order to avoid the sensations of cold, and for the same reason he objected to fresh air. That he might not have the trouble of dressing, he never undressed, and he ultimately remained in his chair all day that he might not be troubled to walk. This is of course an extreme case, but it shows too plainly how the absence of a serious purpose in life may produce mental disorders. Similar effects follow when the activity of a busy life suddenly ceases, and when melancholia, hypochondria, and death in such cases are too well known to the medical practitioner. Like experiences arise in the history of a nation as well as in that of the individual. Of this Greece, Rome, the Netherlands and even France afford examples. The lesson, therefore, is that we must find

out what capacities we possess, and then make the most of them. A healthy and ennobling purpose and the cultivation of our faculties are some of the methods by which the evils of nervous over-excitement may be avoided.

2. The troubles which arise from or are associated with materialistic teaching demand more detailed treatment By materialistic teaching we understand those doctrines which aim at, and result in the negation of religious belief, of religious obligation, and of which the logical outcome is, "Let us eat, drink, and be merry, for to-morrow we die." This teaching can be traced back to a period of great antiquity. According to Colebrooke, among the early Hindoos there were the materialistic schools of the Tcharwakas and Lokayatikas; among the Greeks, those of Diceark, Messina, Leusippus and Epicurus, while in Rome, Lucretius and Seneca were largely followed. But while the gratification of the desires of the materialist appear to lead to happiness, he finds it but a phantom ever eluding his feverish grasp, transforming them into wild and stormy passions, which not only endanger health, but also make shipwreck of reason and life. These varied and disastrous forms of nervous over-excitement may be considered in detail.

(*a*) The immediate desires arising from keen sensual emotions, such as the love of wine, play, and women. The outcome of excessive indulgence in sensual pleasures is, that it constitutes one-third in the etiology or cause of lunacy, while the effects of the nervous excitement, consequent upon the passion of gaming, are only too well known. Emotional and intellectual disorders which follow these excesses are sometimes induced by seemingly trifling incidents. The degradation of art in questionable public advertisements, the leading features in some types of modern novels do not, to say the least, tend to diminish the evils to which I refer. Of 472 observed cases of mental disorders 173 could be traced to domestic sorrows produced by these causes.

(*b*) The immoderate desire for an exalted position. Two

classes of emotions follow this, as indeed they do all immoderate desires. One class, of an expansive form, bright and enlivening; another of a repressive form, dull and depressing; and these influence different individuals, or may in turn affect the same. But one form of this immoderate desire is a passion for fame and glory, which, like all egotistical desires, may be the source of opposite forms of mental aberration. Certain phases of social education must be blamed for these emotional disorders; for false ideas are diffused, and the point, aimed at, is illusory and meretricious. Perhaps of all forms of this immoderate desire, the most prominent is that which takes the form of political ambition, with which is associated the love of wealth and luxury. In democratic communities this is more manifest than in aristocratic, for though the prizes are of less value, they are more numerous, while the attendant evils are more pronounced. One explanation of this is to be found in the fact that the less mental training a man has received in early life the greater likelihood there is that the ill-effects of nervous over-excitability will manifest themselves.

(*c*) The immoderate desire to please. This is traceable to unrestrained romantic emotions, and includes an undue development of the principle of self-love, a principle which, unrestrained, degenerates into vulgar selfishness. Common to both sexes, it is more fully developed in the female than the male. To early training this is largely due, but as a proof that the commonly called superior sex is not insensible of the impressions referred to, may be adduced the fact the most popular corps in the army, or Volunteer forces, are those whose uniform is most attractive; and we have it from one of the highest authorities in the Army that the utmost attention ought to be paid to the dress of the soldier in order that he should be especially attractive to the opposite sex. On the other hand, that the idea is early developed in the female is shewn by the way in which little girls busy themselves about the adornment of their dolls, and by the influence exerted on the minds of older girls by the attractions and excitements of

the drawing or ball room. The ideas, thus created in the mind, and nourished by dalliance with them, may become unregulated, unrestrained, violent passions, while failure to please may produce a reaction as dangerous in the opposite direction. But in connection with the ball-room are circumstances to which serious troubles hereafter may be traced. The costumes, not remarkable for their modesty, the intimate association with the opposite sex, conversations of a trifling and perhaps of a not very elevating nature—these, with the antecedent excitement of preparation, are liable to produce troubles of the nervous system, which terminate in disorders, such as hysteria, indigestion and others of a more dangerous character. Without for a moment condemning the emotions of true love which form a lasting bond between man and wife, it is imperatively necessary to utter this warning voice against those excitations which tend to degrade and to debase the noblest feelings of humanity.

(*d*) The immoderate desire of life. This desire is accompanied by a lack of vigorous mental power, and takes the form of an intensified anxiety to preserve health, which frequently develops into hypochondria. The man who spends his waking moments in nervously watching the different parts of his organism, anticipating some dreaded ill, soon transforms imaginary ills into real ones. He produces the disease which he dreads. Hence the evils arising from the study of diseases by an ill-balanced mind, and herein lies the explanation of the fact that some medical students find their way into an asylum, instead of into Merrion Square or Harley Street. There is too, the danger even to the robust mind, which arises from constant association with the hypochondriacs. As M. Dubois says "There is danger for predisposed minds in living near them." The nervous troubles then which are associated with materialistic teaching are those which arise, *inter alia*, from a mental surrender to an immoderate desire for the objects to which I have drawn attention.

3. The troubles which arise from mystical teaching. Here

we must guard against confounding mysticism with the beliefs and duties of orthodox religion. Ignorant sceptics are prone to confound them for the purpose of casting a slur on *all* religious beliefs. The common character of the chief aspects of mysticism is an immense longing for happiness, coupled with a profound contempt for sensuous things. Regarding the joys of this world, as ever changing and inseparable from pain, the mystic seeks to realise at once the joys of an eternal bliss, while the aim of some is to attain to a mysterious union with or absorption into some divine essence. Their acts of devotion take the form of so-called meritorious or expiatory sacrifices. Others ignore the reward of works, and yield to a certain elevation of the spirit, supposed to be the outcome of a direct spiritual manifestation. Though arising from the same religious source the pathological results are, as may be expected, different, and take the form of catalepsy, hallucination, monomania of pride, etc., according to the characteristics of the individual. A few illustrations may be of service here. The teaching of the founder of mystical pantheism (Vedanta) is that the sage, recognising that God resides in all creatures, forgets all ideas of duality, perceives the all - powerful Being, abandons belief in works, good or bad, becomes perfect and obtains the entire absorption. Another disciple of this teaching maintains that, with absorption into the Great Spirit, other distinctions disappear. The sun of this spiritual knowledge in the heart dispels darkness, penetrates everything, embraces everything, illumines everything. This obliviousness to externals, and absorption into the Divine, is taught in a thousand different ways by Hindoo Pantheism as the theory of supreme happiness. And this theory was incorporated into the teaching of Christianity by the early Fathers. One maintains that the soul, released from the influence of corporeal images, is, by love, transported beyond intelligence and thought, that it rises beyond itself, is absorbed into the Divinity, and that God becomes supreme peace and joy ; that it is, in fact, changed into God as iron placed in the fire takes the form of the fire, and is

changed to fire. Thus it appears that, whether the subjects were fanatical heathen, or fanatical followers of a spurious Christian teaching, the same principle actuated them, and identical consequences were observable in both. As a means of securing supreme happiness various exercises were prescribed. For the penitent ascetic, merits attached to works availed. With the contemplative ascetic softer emotions prevailed. The tendency in the one was to a form of melancholy madness: in the latter to incontrollable enthusiastic frenzy. The instructions in the sacred books of the Vedas for realising this supreme happiness were all in the direction of physical efforts, with the natural consequence of a serious disturbance of the brain with all the evil effects of super-excitation. One devotee describes these efforts in detail, and says that he relinquished them in disgust. Another narrates the effect of the horrible practices enjoined upon him until insensibility supervened. The ultimate issue was such nervous excitation as to drive to the very verge of madness.

The effect of the exercises prescribed for, as we now understand it; "Salvation by Works" were similar in character; physical tortures, frequent ablutions, very necessary at all times, and bodily privations; all to produce an effect upon the soul. Much of that which was supposed to be real and genuine enthusiasm, not only among early, heathenish Christians, but also among later emotional, frenzied, orthodox believers, was due to an unfortunate development of nervous excitability. An old bishop urges various bodily efforts in order to realise the presence of God in prayer. Another pious father, whose words are worth repeating on account of their unintelligible character after stating that the soul, by a particular grace of God forms a special conception of the Deity, says, "The next step is that it considers its considerations, sees its views, discerns its discernment, examines to see if its tranquillity is tranquil, if its quietude is quiet. The outcome of these steps is that the quietude and repose of the soul increase, the powers of the soul are, as it were, in a soft and agreeable supineness, during which,

forgetful of all things, and of itself, it reposes tranquilly in God. The soul then loses itself, not knowing where it is, nor what it is doing." No wonder that the outcome of a state like this is sleeplessness, gloomy preoccupations, and even suicidal tendencies.

Fortunately among Protestants "Salvation by Works" is not the prevailing creed. On the other hand an undue development of the collateral belief, "Salvation by Faith," is beset with similar dangers. The statement that "The Kingdom of Heaven suffereth violence and the violent take it by force" has given rise to the frenzied conduct of the Shakers, Jerkers, Barkers and similar sects, and illustrates the effect of the abandonment of reason to excessive uncontrolled emotions. Impartial and intelligent travellers have described their personal observations in this direction among certain classes in America, Wales, the West of England, the Cevennes and elsewhere, so that we need not enlarge upon them here. But in this, as in most other similar cases, the *via media* is the correct, the safest course. We must pause here, however, lest we usurp the functions of the Theological chair. But the historian finds embedded in the heart of Christianity superstitions of Celtic, Hindoo, Greek and Roman origin, which, directly or indirectly, have reference to magic, astrology, demons, ghosts, fairies, etc. They are traceable to successive layers of religious thought, and can only be eradicated by the pure and simple truth. Some of the finest geniuses of Christendom, to wit, St. Augustine, Luther, Wesley, have not succeeded in freeing themselves from the waves of superstition and mysticism, and their followers have in some cases been the victims of unrestrained emotion and extravagant delirium. Hence in certain districts we have little difficulty in tracing the prevalence of epilepsy and chorea to their rightful cause.

Finally, there are the troubles of the nervous system associated with civilization. It is almost impossible to determine what set of institutions, what combinations of systems go to make up the complex idea of civilization, so it must be at once under-

stood, that it is, at the best, a relative term. In every enlightened nation there are laws, customs, habits, religion, institutions, which go to make up its civilization, and its effect upon the individual can only be estimated, when we know the influence of each element upon the human mind ; and it is only in a few cases that anything like accurate returns of diseases, mental and otherwise, are afforded, any conclusion must of necessity be untrustworthy. The problem of the influence of civilization, whatever that may mean, on the production of nervous over-excitement is practically insoluble, and so we must perforce leave it.

In discussing this important question, I have endeavoured to do so in the broadest possible manner and in reference to the religious part of the enquiry, must disclaim any intention of depreciating any sincere and intelligent feeling and conviction. My aim has been to urge the importance of intelligent conviction on all subjects so that abnormal ideas and the terrible results of nervous super-excitability may be avoided.

4th January, 1898.

IRELAND AS A TOURIST RESORT.

By S. F. Milligan, M.R.I.A.

(*Abstract.*)

On the motion of Professor Everett, the chair was taken by the Lord Mayor.

The Lord Mayor expressed his thanks for the warm reception accorded him. There was no subject that interested him more than the one that was to be dealt with—viz., "Ireland as a tourist resort, and what is being done to develop it." He did not think there was an Irish man or Irish woman who would not agree with him that they possess a most beautiful country, and one that was well worth seeing. He had travelled over most of Ireland, and had visited a good many places abroad, and he considered there were spots in Ireland that for beauty and picturesqueness of scenery could not be surpassed. What they wanted very badly was better hotel accommodation, where tourists could come and feel almost as comfortable as at home. He was pleased to notice that a decided improvement had recently taken place in this respect, largely owing to the efforts of the Irish Tourist Development Association. Of course much remained yet to be done. Another thing which they required in Ireland was more capital, and by making their hotels as comfortable as possible people would be encouraged to visit them; they would then see that Ireland was not such a bad place after all, and probably be induced to invest their money in it. In conclusion, the chairman said it was not necessary to introduce Mr. Milligan to that audience, as he had made him-

self so well known in connection with everything that was for the benefit of the country in which he lived. He had done a good deal to popularise Ireland as a tourist resort, and his lecture was sure to be brimful of interest.

Mr. MILLIGAN said the object of that night's lecture was twofold—to try to develop the tourist traffic in Ireland and to raise money for the Causeway defence—in both of which they hoped to be successful. He had selected the subject of tourist development because of its importance to this country, and particularly to those districts known as congested. Those who travelled usually went abroad because they did not know the beauties of their own country. If Irish people were deficient in their knowledge of Ireland, English people were more so, and required enlightenment. He would be ashamed to confess that he knew foreign countries better than his native land. No reasonable excuse could now be offered why such a state of things should continue. The hotels in the districts where the scenery was situated were all that could be desired, and from a sanitary point of view, superior to hotels in the tourist districts abroad. It was only reasonable to hope that the people of the United Kingdom should become better acquainted with each other, and that Ireland should be visited more frequently by those who want to have a good holiday, as well as invalids in search of health. They had great variety of scenery to suit all tastes— magnificent sea cliffs in Donegal, beautiful sylvan glades, lakes and rivers, encircled by fine mountain ranges in Sligo; heath-clad hills and mountains, and picturesque tarns and lakes in Connemara; in Wicklow glens and waterfalls, and lovely rivers flowing through beautifully-wooded valleys, too charming for description; they must be seen to be realised. In Kerry they had all these features combined, and, added to these, the soft balmy air of the southern Atlantic, tempered by the waters of the Gulf Stream, which rendered it a perfect paradise and health restorer for the invalid, or overworked man of business.

In a work published in London in 1622, entitled, "The

Complete Gentleman," it was on record, "If any one applied for license to travel in foreign parts, to the Lords of the Council, that the Lord Treasurer Burleigh would first examine him of England, and if he found him ignorant, he would bid him stay at home and know his own country first." Such a course now, though arbitrary, would greatly help tourist development in Ireland. Many books of travel had been written about Ireland, from the time of Gerald de Barry and Edmund Spencer, down to that most interesting writer on Ireland, the Rev. Ceasar Otway, and they had individually and collectively referred to Ireland as one of the most fertile and lovely countries in the world. The difficulty of visiting the remote districts of Ireland where the best scenery is situated, coupled with the absence of good hotels, would account for the small numbers who, up to recent years, visited the outlying parts of Donegal, Connemara, and Kerry. The cessation of political agitation, and the opening np of those hitherto almost inaccesible districts by light railways had given a great impetus to tourist development.

The lecturer now gave a graphic description of the Antrim coast, leaving Belfast for the Causeway by the Coast road, referring to the lovely Vale of Glenariff and its waterfalls, and the fine pathways made by the Northern Counties Railway Company through the Glen, the wooden bridges over the falls, the Tea House in Glenariff, and other interesting features of the Glens, the great headlands and sea cliffs, and the Giant's Causeway. The beauties of the valley of the Roe from Limavady to the glen above Dungiven were referred to, most charming scenery, rivalling that of Wicklow.

Londonderry was referred to as follows :—What memories the City of Derry awakens in the student of Irish history from the time St. Columbkille, in the sixth century, founded there his Celtic monastery amongst the beautiful oak woods he loved so well, down through the ages to the time Sir Cahir O'Doherty slew the governor and burned the city. Next, the memorable siege and noble defence in the reign of William the Third, that bore such important results.

Proceeding from Derry to Lough Swilly we pass the Grinaian of Aileach, the ancient fortress of the Kings of Ulster, and a seat of sovereignty from prehistoric times. During the summer months a steamer sails from Fahan, a station on the Buncrana Line, up Lough Swilly to Portsalon, some thirteen miles across—a sail once taken that will not soon be forgotten. There is a most comfortable hotel at Portsalon, from which excursions can be made. Mulroy Bay and the Rosapenna Hotel are not far distant. A public conveyance leaves Rathmullan daily for Rosapenna, where the accommodation is everything that could be desired, with excellent golf links, good fishing and boating. Views were shown of the great headlands outside Lough Swilly, Malin Head, Horn Head, and round further south, the giant cliffs of Slieve Liag, 2,000 feet high, and the lovely valley of Glencolumkill, with its stone crosses and penitential stations. The lecturer described the County Sligo scenery, and showed views of Glencar Lake and waterfall, Lough Gill, its islands, and holy wells, and the waterfalls of Ballisodare, Knocknarea mountain and glen, and some of the interesting prehistoric monuments that are so common in County Sligo. A sketch was next given of the coast scenery of Achill, Clare Islands, and Clew Bay, the great sea cliffs of Achill, also Croaghpatrick, from which St. Patrick drove the last serpents from Ireland, and the new Mallarany Hotel, between Westport and Achill. This hotel is situated in the midst of the finest scenery of the west coast, and close to the railway station. Views of the bays and estuaries of County Kerry and its noble mountain scenery were shown, as well as of the new southern hotels at Kenmare, Waterville, Parknasilla, and Caragh Lake. These hotels were fitted up with every recent improvement, including Turkish baths, salt water and fresh water baths, and offer trout and salmon fishing, as well as shooting over 25,000 acres, to their visitors free of charge. The average mean temperature in the vicinity is 52 Fahr.—a higher register than Torquay or Ventnor. These hotels are of great benefit to invalids who require

a mild climate in winter, and save them the fatigue of a journey to the South of Europe.

The lovely scenery on the Blackwater from Youghal to Lismore was illustrated. Youghal was referred to as that ancient town hallowed by reminiscences of the great Sir Walter Raleigh, whose house still survives, its old wainscotted rooms being most cosy and comfortable still. What interesting visions might there be enjoyed of Irish kerne and gallowglass, and English adventurers seeking for rich Irish lands—of Boyle, first Earl of Cork; and of Spenser, too, who probably discussed the "Fairy Queen" and smoked a friendly pipe with Raleigh under the shade of the great yew trees that still stand in the garden before the home.

The lecturer next took his hearers to Wicklow, to Glenmalure, with the memories of the O'Tooles and Byrnes, and to Glendalough, the ancient ecclesiastical city that ruled the Celtic Church before the See of Dublin superseded it, the Dargle, Enniskerry and Sugar Loaf Mountain, the Scalp, Glen of the Downs, the Grand Hotel, Greystones; Newrath Bridge Hotel, Waterfall, Devil's Glen; Meeting of the Waters, Royal Hotel, Glendalough; Vale of Avoca, Wexford, New Ross, Vinegar Hill, Enniscorthy, &c. The district through which the Dublin, Wicklow, and Wexford Railway Co.'s system runs. possesses for the tourist attractions of a most varied character. It would be difficult to find elsewhere, contained within so limited a space, such a combination of scenery—high rugged mountains, wild glens, wooded hills and valleys, lakes, rivers, and waterfalls, all bounded by a varied and picturesque coast. It also abounds in objects of antiquarian interest, ruins of castles, abbeys, round towers, and Celtic churches, &c. A fine series of views were shown on the Great Northern Railway system, including the Boyne Valley. This valley is very rich in ancient monuments of Pagan, early Christian, and Anglo-Norman times. These include the great Pagan Pyramids of Dowth, Nowth, and New Grange, the first and last of which were ransacked by the Danes in the ninth century, but Nowth

4

still remains intact. Next are the ruins of Mellifont Cistercian Abbey, where Queen Dervorgill, wife of O'Rorke of Breftney, who afterwards eloped with MacMurrough, ended her days. Further up the river, at Slane, there are ruins of the abbey on the site where Saint Patrick lighted his Easter fire in sight of Tara Hill. Further up still, the traveller comes to Donaghmore round tower, Bective Abbey, and Tara Hill. If we proceed to Kells and Trim, what a wealth of Anglo-Norman castles there are, sculptured crosses, ancient churches, stone-roofed houses, holy wells, and relics of Ireland of the most varied kinds extending over long ages. The rich pastures and beautifully wooded landscape form a perfect picture. Nearer Drogheda is the site of the great battle fought between James II. and William III., and the Obelisk marking the spot where Duke Schomberg fell.

The scenery of Lough Erne was next described and pictured on the screen, including Devenish and the lovely wooded islands of the lake ; Beleek and the salmon leap at Ballyshannon. Next Bundoran, the splendid, bracing watering-place, with its cliffs, caves, and fairy bridges. The fine hotel has been greatly enlarged, and there are extensive golf links. The trout-fishing on Lough Melvin, near Bundoran, was referred to, as well as the salmon-fishing on the Erne. Leaving Bundoran, one can easily cross via Ballyshannon to Donegal, where are ruins of the ancient Franciscan monastery, where the four masters compiled their great work. The castle was built in Queen Elizabeth's time, and the River Esk flows at its base. Here the West Donegal Railway is reached, and the tourist can start for Killybegs, with charming glimpses of Donegal Bay en route. The scenery of the district from Killybegs to Carrick is very fine. Views were shown of Fintra Bay, Teelin Harbour, Slieve Liag, Glencolumkill, and the salmon leap at Carrick. The district about Galway, on the Midland line, was described, and views were shown of the wonderful swallow holes within a couple or three miles of the city of Galway, where a river disappears into the earth, and is seen no more ; of the

Railway Hotel in Galway, which is leased by Major Hackett, who is a model and genial host. This gentleman has purchased the hotel at Clifden, and is rebuilding it. The railway company are also building an hotel at Recess, where there is a fine salmon fishery, just in the heart of Connemara. There is also a first-class hotel at Leenane, most picturesquely situated on Killery Bay. A country possessed of all these varied attractions, with the pure air of the Atlantic fresh from nature's laboratory, should not have much difficulty in attracting visitors. Why had travellers been so scarce in the past? Some of the reasons had been already given—the difficulty of travelling and the absence of good hotel accommodation. These wants had now been supplied by the light railways and new hotels. But Ireland had suffered in the past from another cause, and that was the absence of the Royal Family. Royalty had not patronised Ireland or the tourist traffic would have been as large as it was in Scotland to-day. A royal residence and more frequent visits from members of the Royal Family would tend to alleviate some of the ills from which this country had suffered. The welcome given to the Royal Duke and Duchess last summer in every part of this country, by every class and section of the Irish people, showed clearly that the policy which kept Royalty from these shores had been a mistaken one. The Shannon route was opened to the public on the occasion of the visit of the Duke and Duchess of York, the Lower Shannon from Limerick to Kilrush, as well as the Upper Shannon from Killaloe, in Clare, to Dromod in Leitrim. The Steamer from Killaloe passes Kincora, the site of Brian Boru's palace, into Lough Derg, which contains many islands, one of which, Inniscaltra or Holy Island, is the site of an ancient Celtic monastery. There are the remains of seven churches and a round tower on the island. The principal ruin was the earliest Romanesque church erected in Great Britain or Ireland, even before Canterbury Cathedral. The steamer in going up the river passes another most ancient ecclesiastical site, that is Clonmacnois. Here are two Round Towers and ruins of several churches and sculptured

crosses of very great antiquity. Athlone comes next, some nine miles further up, and is a most interesting town. It has a castle, built in the year 1210, that stood a siege, and is still used as a barracks. The steamer then enters Lough Ree, a wide expanse of the Shannon, studded with islands, on which stand ruins of ancient Celtic churches and Norman castles, and finally reaches Dromod, in County Leitrim, from whence the traveller can proceed direct by rail to either Dublin, Belfast, or Sligo. The Shannon is the noblest river in the United Kingdom, and the opening of it for tourist traffic is a most important feature in the development of Ireland. Mr. Milligan gave an interesting summary of what our railway companies are doing to induce English people to come to Ireland. An office has been opened at 2, Charing Cross, London, where an agent attends to give information and issue tickets to every part of Ireland. The tourist rates, he pointed out, were now exceedingly low to every health resort and tourist district in the island. The channel service was everything that could be desired. Time would not permit to refer to the beauties of County Down, or the magnificent mountain scenery of the Kingdom of Mourne, which was in their territory The County Down Railway Company would have completed for the ensuing season their new hotel at Newcastle, which would be one of the very finest tourist hotels in all Ireland.

In conclusion, Mr. Milligan said he hoped all the varied attractions—the half of which had not been enumerated—in this lovely land would soon produce a rich harvest of visitors, and that the charming scenery off the beaten track would soon be beaten enough by a regular Anglo-Saxon invasion crossing over to get better acquainted with Ireland and her people, with the result that they will become assimilated with them, and form henceforth a more united and homogeneous nation.

The lecture was illustrated by no fewer than 150 specially prepared lantern slides of Irish scenery and antiquities, thrown upon the screen by Mr. Hogg (the representative of Mr. J. Lizars).

Mr. JOHN WORKMAN, J.P., said he had much pleasure in proposing a vote of thanks to Mr. Milligan for his very able lecture and the elaborate series of views he had shown. He agreed with Mr. Milligan that there was no scenery like that of Ireland. He, himself, had been a good deal abroad, but he had seen nothing to beat the North of Ireland.

Mr. WILLIAM GRAY, M.R.I.A., said he had much pleasure in seconding the proposition. Mr. Milligan had demonstrated what he (Mr. Gray) had never any doubt of, that Ireland was the finest country in Europe. There was no country with the same area had the same variety of beauty.

The LORD MAYOR said he thought it was hardly necessary for him to say anything in support of the vote of thanks except out of compliment to their good friend, to ask them to pass it by acclamation. He assured Mr. Milligan it gave him great pleasure, indeed, to be the medium of conveying that vote of thanks, and he would like to add that one striking thing in the lecture was the familiarity which Mr. Milligan had shown with the entire subject, and the magnificent way in which he had pronounced the Irish words.

Mr. MILLIGAN returned thanks.

Professor EVERETT, F.R.S., proposed that a hearty vote of thanks be passed to the Lord Mayor for presiding.

Mr. ROBERT YOUNG, J.P., seconded the resolution, which was passed with much enthusiasm.

1st February, 1898.

PROFESSOR J. D. EVERETT, F.R.S., President, in the Chair.

THE EISTEDDFOD AND THE FEIS CEOIL.

BY EDITH OLDHAM, A.R.C.M.

(Abstract.)

Mr. W. B. Yeats, the distinguished Irish poet, said recently in connection with a movement for the bettering of agricultural conditions in Ireland, "The end of all government, the end of all politics, the end of all movements. is the making of character."

The interdependence of national genius and character is a subject on which might be written volumes. The building up of national character is the preliminary step to any full revelation of national genius. The means of doing this are manifold, and the claim which the Feis Ceoil makes for support from the enlightened people of Ireland rests on these two reasons—first, the revelation of national character, and, secondly, the revelation of national genius.

That Ireland was great in song and music is a fact of the past. That her position at present in music is not a great one is a fact of the present. How far the disastrous history of Ireland accounts for the decadence is a matter of opinion. We can, however, say with absolute accuracy, that for many years conditions have been unfavourable to the development of the musical genius of Irish people. It is the ardent hope of many members of the Feis Ceoil, that disabilities being removed, and encouragement given to the Irish people in this direction,

the latent fires of genius will once more spring into activity. But there is the other and perhaps greater claim for support—the formation of national character. Ireland may or may not become a musical country. Her supremacy in olden times does not go to prove anything; because the folk song, in which lies the preëminence of Ireland, is to modern music what the Homeric Legends are to Greek literature, or the rude ornament of a savage people to the pictures of modern painters. But national character depends upon the cultivation of self-reliance and independence, upon self-control and perseverance, and upon many other qualities which are developed and trained by organizing such movements as the Feis Ceoil. For it is by creating Irish institutions, founded and supported by Irish men and women, institutions which do not depend on English or foreign patronage or approval for their success, that national character can be developed and built up. In the Feis Ceoil are ideals and hopes which are not bounded by the merely artistic success of the movement. That is an essential of course, but we have aims which, if rightly stated, must appeal to every man and woman who desires better things for Ireland.

We might add to the words of Mr. Yeats quoted above, that the making of character is the object of all education; and the two institutions which give the title to this paper are educational in the very highest sense. The Eisteddfod of Wales, which has been the model in many respects of the Feis Ceoil, is an institution with a peculiar and unique interest of its own. It is not a musical and artistic event pure and simple; it is the expression of the ideas and culture of a nation, and embodies its highest aspiration—the outward and visible sign of inward and spiritual forces, which make for what are the most fruitful sources of happiness and good. It has grown up with the people, and, after years of existence and association with them, is as much to the Welsh people as the hand is to the craftsman, or pen to writer. Take the Eisteddfod from Wales, and you deprive a nation of its speech—a people is left, dumb and inarticulate, filled with yearnings and desires which find no

expression in the social and economic conditions in which it lives. Man does not live by bread alone, and it is not in the possession of warm clothes and comfortable dwellings that the great factor of human happiness, which for want of a better word I must call the soul, finds its being. It constantly desires the better things. But, in time, a people deprived of the legitimate outlet for its ideality and imagination comes to regard these things with listless apathy, and in an emotional people a vague discontent, and restless dissatisfaction of the cause of which they are themselves perhaps unaware, take their place.

Such a people are the Irish of to-day. Ireland, once the home of a living art, still possessed of traditions of greatness in the higher things, still endowed with a spirituality which centuries of misgovernment and misunderstanding on the part of the ruling race have not eradicated, Ireland, the land of song, sings no more, and discontent—"divine discontent," could we but rightly trace its source—eats out the heart of her people.

What may be described as a fraternity having the true and highest national aims has existed in Wales. This is the Gorsedd of the Isle of Britain, which dates its origin to remote times, and which, by holding festivals called Eisteddfodau, has endeavoured to keep alive the interest and enthusiasm in poetry, music, and art. The general aspiration of the Gorsedd is embodied in the prayer, which is the only religious episode in the whole event. It is said to be handed down from pagan times:—"Grant us, O God, thy protection; and in that protection, power; in that power, wisdom; in that wisdom, knowledge; in that knowledge, knowledge of the just; in knowing the just, love; and in love, the love of every attribute; and by loving every attribute, the love of God." This prayer touches the highest note in the gamut of national aspiration. Such aspiration illumines and dignifies every effort of however apparently trivial a character made in the direction of true progress.

The details of the Eisteddfod vary very considerably from

time to time. The programme embraces competitions in literature, art, and music. In Ireland this Feis Ceoil has only to do with music, but a time may come when an amalgamation of such societies as the Arts and Crafts Society, The National Literary Society, the Gaelic League and the Feis Ceoil may come about, and annually hold a Festival resembling the Welsh Eisteddfodau.

The most remarkable feature at present in the programme of the Eisteddfod is the choral contests. Almost every town and village sends up its choir or glee party, and the interest in these events is intense. The wooden pavilion in which all the proceedings take place is specially constructed for the occasion, and is capable of seating over 12,000 people, and on the days on which the choral competitions take place it is crowded in every part with people who come from all parts of the country.

With regard to numbers, the Feis Ceoil cannot compare with the Welsh Festival. But throughout all the competitions I think we have a distinctly higher standard. Even in the choral competitions unaccompanied singing is enforced in all our competitions, which is not so in Wales. A marked difference with us is the class of competitors. In Wales the working classes are the bulk of the competitors, but this is a point to which the Feis may yet attain. The results so far have tended to great encouragement, the formation of local choral societies being the most gratifying result of the efforts of the Feis Ceoil.

In any organization of the kind in Ireland it would be impossible to omit the subject of the traditional music of Ireland. Sir C. H. H. Parry says of Irish music that it is "the most human, most varied, most poetical and most imaginative in the world." It is scarcely possible to over-estimate the importance of our folk music. It appears more and more that the *national* note in music is becoming important. Now that what may be called the technique of musical composition has been so thoroughly mastered, the new source of inspiration must be supplied by the extraordinary vigour and freshness of

Folk music ; and certain it is, that while it is international in the sense that it is great art, the music of Liszt, Greig, Brahms, Wieniowski, and other modern composers of the first rank is national in a very literal sense. If we have any hope of forming a modern school of Irish music, we must lovingly preserve and make known those precious outpourings of an earlier and less conventionalised civilization.

The happiness of a people, its self-respect and its character are inextricably bound up in its arts and crafts, its music, its painting, its literature. These are the real things that endure to the end, not the ephemeral changes that warfare and material progress bring about. Battles have been fought and won, dynasties changed, and it has made but little difference to the world. What has done so has been such a thing as the impress of a mind and art like the Greek. Such an influence is practically imperishable.

To teach a people to stand firmly on its own merits, not to imitate the fashions and ideas of another race, but to lift its head among nations, as a self-respecting and self-reliant entity in the civilization of the world, contributing its impetus to the progress of the human race, perhaps adding some inestimable gift which no other people can give—this is the true nationality and it is with ideals such as these that the Feis Ceoil has been founded, and that the Eisteddfod has been kept alive for so many years.

On the conclusion of the lecture vocal selections in illustration of some of the more beautiful but less-known Irish airs were given by Mr. W. Thomas and Mr. W. Curran. Mr. Thomas sang "Movourneen Mine" and "The Heather Glen," as arranged by Signor Esposito, while Mr. Curran gave "The Lament for Owen Roe O'Neill" and "The Return from Fingal," arranged by Dr. Stanford. A number of the tunes played on the Irish bagpipes in the competitions at the Feis Ceoil in Dublin, were reproduced on the phonograph, under

the direction of Mr. J. P. Sinclair. A Scotch bagpipe selection which was added served to point the contrast between the Irish and Scottish pipes as regards musical quality.

Mr. Adam Duffin, in moving a vote of thanks to Miss Oldham, said she had in her beautiful and eloquent essay touched some of the finest chords of Irish patriotic feeling. It was a pleasant thing to think that in this movement the North was not precluded from joining hands heartily with the South, and they were thankful to Miss Oldham for trying to impart to them some of her own enthusiasm in regard to the Feis Ceoil.

Dr. St. Clair Boyd, in seconding the vote, thought it was only fair to say that but for Miss Oldham the Feis Ceoil would certainly not have been the success it was, even if it had been held at all. He hoped, now that the movement had been taken up in Belfast, that every one interested in it would do their best to assist it, which they could do by becoming subscribers. The local Committee were doing all in their power to make the forthcoming gathering a success.

The vote was passed with acclamation, and in acknowledging it Miss Oldham said Belfast choirs had carried off two of the principal prizes at the Dublin Feis, and this year Dublin was going to send down at least one choir as a direct challenge to Belfast.

A vote of thanks was also passed to Messrs. Thomas, Curran, and Sinclair, on the motion of Professor Fitzgerald, seconded by Mr. A. S. Matier.

1st March, 1898.

PROFESSOR M. F. FITZGERALD, B.A., M.I.C.E., in the Chair.

RAILWAYS AND THEIR PRACTICAL WORKING.

By W. H. MORRIS, C.E.

(Abstract.)

MR. MORRIS commenced with a descriptive account of the old plateways from the year 1676, and their various progression stages, leading up to the introduction of railways at the commencement of the present century, and, after giving particulars of the famous "Puffing Billy" and other noted locomotives, the opening of the Stockton and Darlington Railway in 1827 and the Manchester and Liverpool line. He gave an account of the engines and carriages used, the difficulties of promotion and construction, and of the competitive engine trials at Rainhill, when Stephenson's "Rocket" won. After telling of the famous "battle of the gauges," which lasted for upwards of fifteen years, and various other historical facts, such as the more recent "race to the North," Mr. Morris dealt with the more practical part of modern railway appliances. He next dealt with the various kinds of permanent way and the manner of construction, and with the superiority of timber sleepers over iron or steel, of the train staff in use to prevent collision on single lines, and the block telegraph system ; also of that most important matter of interlocking and signalling with the many safety appliances in use by railway companies, and in addition referred to the other sundry and necessary precautions, such as sight-testing of railway men for colour blindness and defective vision, &c.

The lecturer concluded with a number of most interesting statistics. Amongst these he mentioned that the total amount of railway capital in the United Kingdom is £1,029,475,335, which is considerably greater than the national debt. The gross receipts for 1896 were £90,119,122, and the working expenses £50,192,424, while the number of passengers carried annually were so great and the fatalities so few that if a person travelled daily from Belfast to Dublin and back he would, according to the law of average, require to make these journeys for over 4,000 years before the railway terminated his earthly career. The present rolling stock was so great that if it was all coupled up together it would form a train long enough to encircle the British Isles, whilst the number of railway servants was greater than the British Army at home and abroad, Army Reserve, and Militia all combined.

Mr. John Horner moved a vote of thanks to Mr. Morris for his able and interesting lecture.

Mr. John Pim seconded the motion, which was passed by acclamation.

The Chairman, in conveying the vote to Mr. Morris, said that by the averages as to accidents which he had given, it would appear that if they had a railway to the sun they would be killed twice on the way, so that they would never get to the sun.

Mr. Morris briefly acknowledged the vote.

26th April, 1898.

Professor J. D. Everett, F.R.S., President, in the Chair.

THE EVOLUTION OF FLOATING AND OTHER DRY DOCKS.

By James Maxton, M.I.N.A., M.I. Mar. E.

My object in writing a brief Paper on Floating and other Dry Docks, is to stimulate a desire in Belfast to keep ahead of, or at least in line with, the times, and to ventilate a subject closely associated with the Shipbuilding and Shipowning interests, and hence with our progressing and enterprising City, rather than to bring before you any novelty or unique experience in the design or construction of these conveniences and necessities of a Maritime Nation.

To have written a Paper on the latest and most approved types of Dry Docks would have given me very great pleasure, but it would hardly have been suitable for our Society, whose membership includes many who are not closely in touch with Shipping, but who, nevertheless, take a lively interest in all that pertains to Great Britain's Maritime greatness and supremacy.

History of Dry Docks.

From the days of Noah, and earlier, there must have been means of examining externally the bottom of ships or other structures that float upon the surface of the water. With small Craft this was a simple process, but as vessels became larger not a little difficulty must have been experienced by nautical men to repair or examine their vessels without injury to the structure.

The natural method to get at the bottoms of vessels is to haul them up high and dry, and in tidal harbours, the one still resorted to, is to select a suitable beach, and at spring tides gently strand the vessel, and when the tide recedes heel her over to one side or the other as required, and await the next spring tide to float her off.

It was and is a common thing to excavate round the vessel and form a dam and so protect the workmen from any incursion of the water. These operations had to be resorted to in order to caulk and pay the bottom seams and butts of the planking; the process was generally known as "Graving," and no doubt this was the origin of "Graving Dock," dock where "Graving" or "Paying" could be performed with little risk or interruption. It was only a step to select a tidal creek, build a wall across the entrance, and demolish the latter when work was finished.

The next development appears to have been to make this enclosure more symmetrical, watertight, and secure from flooding, by excavation and building side walls with a gate on entrance, and so permit of work within going on with regularity.

The first of the modern Graving Docks appears to have been constructed about the year 1623 at Deptford. In this dock the water was allowed to flow in, at high water the vessel was hauled in, berthed and shored, and when the tide receded leaving the bottom of dock dry, the gates at the entrance were closed, preventing the next tide from flooding the dock and floating the vessel.

In more recent years Graving Docks have been deepened and artificial means adopted to accelerate the removal of the water, so that the vessel's keel may be much below the level of the water outside, at low water mark, thus admitting vessels of greater draft than the difference in rise and fall of tide; nevertheless I think they have hardly advanced with the times, as, will be explained later.

We have a very good example of a modern Graving Dock in Belfast, 880′ + 83′ 8″ + 26′ 6,″ which may be divided in three sections; a more recent one at Glasgow, and a still larger one

in Liverpool is now under construction, to eclipse all other dry docks, 920′ long + 94′ width of entrance, and 23′ to 34′ over sill at high water.

In Britain the most modern docks are constructed of concrete with granite copings; others are hewn out of the solid rock ; others constructed of hard or soft stone ; and a few of wood. In America a great number are constructed of wood, and I know of a few improvised iron dry docks. It is all a matter of locality, material at disposal, and money.

Gridirons.

A gridiron consists of transverse timbers, on blocks fastened to piles, or resting on and attached to the rock.

The older kinds are only of use where there is a convenient rise and fall of tide. The vessel is hauled over the structure at high water and listed shorewards, and on the falling of the tide the bottom is accessible. A modern adaptation of gridirons will be referred to.

The principal objection to gridirons is that only a short time between tides is available for work, and they are therefore unsuitable for substantial repairs. They are, however, very useful for minor examinations and repairs, and being cheap to construct are to be found all round the coast.

In passing I may mention a process to avoid the use of a dry dock, which is termed "Careening" or "Heaving Down." It is often resorted to for examination of a vessel's bottom, especially in sheltered ports that have no rise and fall of tide, nor Graving Docks. It is attended with some risk, especially when the range of stability of the ship is unknown. The loss of H.M.S. "Royal George," was the result of ignorant careening. It is, however, often resorted to, and it was performed at my request last year on a vessel in Holland ; the photo shows the keel of vessel above water level. In this case it was done to examine and temporarily repair the damage to bottom plating.

Large vessels were often strained by careening, and the practice no doubt will soon cease. A design for a self-careening

modern steamer, however, has been suggested which would enable cleaning, painting, or temporary repairs to be effected, where no dry dock or other conveniences were available.

Slipways.

The Slipway, generally called Patent Slip, is a more mechanical contrivance for external repairs, and consists of a cradle running on wheels along an inclined track. This cradle is lowered sufficiently below the water level to allow the vessel to be floated above it, then the cradle with the vessel is hauled high and dry by powerful machinery. The process is very quick, but risky, and many accidents have happened at the operation.

Slipways are hardly suitable for large steamers, but are convenient and much used.

There was one in Belfast, but it was removed some years ago. A small one may be seen at Carrickfergus.

Screw Docks.

The Screw Dock, as the name implies, is a platform on which vessels may be placed and raised by means of screws. The first sample was built in 1837 and was of American origin, in which country there are still a number. In 1836 the screws of the original dock were replaced by hydraulic lifts, which are more effective and easy of manipulation.

Lift Dock

A slight modification of the previous dock was constructed in the Victoria Docks, London, in 1857, and worked by Hydraulic Jacks. These jacks carried Pontoons, or Saucers, as they were called, which were lifted with the vessel. The pontoons, when drained were made water-tight, the vessel was then hauled to a gridiron and deposited thereon.

This dock had a great capacity depending upon the gridiron area at disposal, and was more adapted for ports where there was little or no rise of the tide.

5

Floating Docks.

In my opinion the introduction of the Modern Floating Dry Dock was a considerable advance upon any previous contrivance for docking vessels, and is both scientific, practical, and economical, merits which are being more appreciated every day.

The history of their origin and development is very interesting.

Camel Dock.

In the reign of Peter the Great it is reported that a Geordie Captain had a vessel in the Bay of Cronstadt, which it was imperative that he should recaulk, and there being no dry dock available the Captain cast about and found an old craft much larger than his own, which he purchased for a small sum ; he then gutted out the hulk, cut one end off, fitted gates to it, floated his vessel inside this improvised contrivance, closed the gates, pumped out the water contained in the space between his own and the old craft, both floating; so the idea of a floating dry dock originated, and to the present day these docks and other similar contrivances are known as "Camels."

No doubt the news spread and practical minds saw a future for docks so constructed, and in or about 1774 a dry dock embodying these principles was constructed at Devonport by a shipwright named Aldersley, and a year or so later one was built by Watson on the Thames.

In 1809 one was designed by Trevithick & Dickinson, to be constructed of iron, with cellular side platforms to make the structure stable and give reserve buoyancy to avoid sinking too deep, but the dock was never constructed.

Sectional Docks.

In 1837 a Sectional Floating Dock was invented, which was the pioneer of many which are much used to this day.

The earlier ones were constructed of wood and consisted of a series of large pontoons, transverse to the vessel which they support, each section or pontoon having a house on each end,

built on vertical supports. These vertical supports acted as guides for a float, and the process of docking of vessel was :— First fill the Pontoon with water, raise the floats by means of screws which depressed and submerged the pontoon, haul the vessel between the floats, screw down the floats until the keel of vessel rested on pontoon, then shore and pump out the pontoon, floating the vessel and dock to a convenient berth, where the vessel if so desired could be hauled with its launch-ways to a prepared track, thus introducing the principle of the more modern depositing dock. Each section was detachable and could be docked for repairs or painting, on the remaining sections.

The introduction of iron and the use of Hydraulic jacks instead of screws for raising and lowering the floats, have made this dock a great favourite for despatch and convenience.

Balance Docks.

In 1848 the American Government had constructed of wood a dock of the "Balance" type, which consists of a bottom pontoon with cellular wall sides, and derives its name from the method of submerging. Being of soft wood it will not sink when water-logged ; to overcome this there is an upper deck in the side walls which can be filled with water, thus loading the structure conveniently to submerge it to a suitable draft.

When the vessel is berthed the water is allowed to drain off the deck and the cellular structure is pumped out, lifting itself and the vessel. The dock is sometimes fitted with gates and then is capable of raising much weightier vessels. One of the main features of the modern and most perfect type of floating dock.

Rennie's Dock.

The father of the modern metal floating dry dock was Mr. C. B. Rennie, who designed and had constructed in 1859 a dock for Carthagena, to lift a dead weight of about 6,500 tons, an achievement to be proud of in those early days of iron structures.

Subsequently in 1869, a floating dock capable of lifting a vessel of 10,000 tons weight was built to Rennie's designs for Bermuda, on the "Balance" system and U section, with numerous watertight divisions and decks, the object being to self-careen the dock for cleaning or repairing the bottom, but the stability was not all that could be desired, and when taken out to Bermuda the operation of careening was never attempted, and in consequence corrosion rendered the dock inoperative. The cellular portion was subsequently partially filled with concrete and the dock is now used as an ordinary graving dock with end gates fitted.

Bramwell's Dock.

The next improvement is to be found in Sir Frederick Bramwell's dock, designed and constructed for St. Thomas. The pontoons were independent and could be detached for self-docking, but the walls were continuous lattice girders, to give the structure a certain rigidity absent in the sectional docks of America. It is regrettable to note that the merits of self-docking were not universally adopted in subsequent designs until a later period; now all floating docks are so designed that they can be docked in sections, or all parts made accessible in some convenient manner.

Depositing Dock.

The first modern side depositing dock was the Nicolaieff Dock, designed by Messrs. Clark & Stanfield, and constructed in 1878; it has since been removed to Sebastopol. The principal merit is its capacity, it can lift and deposit on a suitable gridiron a number of vessels, or the lifted vessel may remain upon the dock if convenient. Another commendable feature is, that vessels of abnormal beam such as paddle steamers, or the Popoff ironclads, can be dealt with on this type of dock without necessarily increasing the beam of structure. The stability of the dock when submerged is provided for by a floating counter-balance, which is somewhat in the way when

the dock is being hauled about to deposit its load on the grid-iron, and the large area required for operation somewhat prevents the more general adoption of this type, but with plenty available room and a brisk shipping business this is about the cheapest and most convenient form of dry dock. A large rise and fall of tide, however, somewhat curtails its use.

The Off Shore Dock.

The Off Shore Dock is of recent date and has been designed to meet special circumstances and localities. It somewhat resembles in form the depositing dock, except that it merely rises and falls with its load and the tide. Its principal advantage is that a vessel can be hauled broadside on, a merit worthy of consideration with firms or public bodies who have limited water frontage, or where there is a narrow water-way with strong currents or tides. Its principal objection is that it is not self-contained but must have shore attachments, involving additional expense in construction and upkeep, and preventing its removal to another site without preparation.

Generally, this outline description covers the field in dry dock architecture; there are numerous modifications, but the general principles are embodied in these remarks or explained during the course of reading when referring to the illustration, and I shall therefore only briefly refer to the necessary pumping arrangements associated with dry docks.

In most of the smaller graving docks the emptying of the docks follows the falling of the tide as a matter of course, where there is a sufficient rise and fall of tide to be of service, but in the larger and more modern type a powerful pumping installation is provided to more quickly empty the dock and so permit access to the vessel's bottom. These pumps are now almost universally of the centrifugal type, which for small lifts are found to be very effective, convenient, and easily maintained. Usually the pumps are connected direct to high speed steam engines, but in a recent floating dry dock electric motors have been utilised and coupled direct to the pumps

and supplied by power from a central generating station on shore; outside the pumping machinery there is little steam power required in a graving dock. The gates, or caissons, are usually worked either by steam, gas, or hydraulic engines. Sometimes warping capstans and cranes are provided to expedite the berthing of vessels and facilitate repairs.

With floating docks, mechanical contrivances are far more numerous and the saving of labour has been much more studied than in graving docks, and it has always struck me as a curious fact that so little attention has been given to mechanical aids in the case of graving docks.

I have noticed side by side a new graving dock and a pontoon dock, where every facility was provided in the latter and totally absent in the former. Perhaps some gentleman present might suggest a reason for this. The only one that occurs to me is that the graving dock is usually the property of a public body who has a monopoly, and who finds it perhaps more difficult to advance in the direction of progress than the private firm who must cater for business in an age of severe competition. And I would most earnestly appeal to Harbour Boards and Trusts to study the desires, conveniences, and economies of shipowners in a liberal spirit, and to bear in mind that competition exists not only between private firms but between large shipping centres.

Take as an illustration the process of securing the use of a dry dock. The vessel has to be "entered" and deposit fee paid (sometimes this is a heavy item), then the process of regulating all at a specific hour and place and other routine preliminaries, and if by some unforeseen circumstance the vessel misses her turn and has to leave the port the deposit fee is forfeited. I have no doubt large public bodies have to insist upon very rigid methods of procedure, but private firms have been compelled to dispense with these, and with them there are no deposit fees, and "entering" can be done at all hours, and perhaps best of all, the firm's representative with persuasive smiles and saponaceous manner solicits the shipowner's custom and makes many concessions here and there, all tending to

smooth the somewhat rugged path of the worried shipowner. Only the other night I was enabled to enter, regulate and dry dock a vessel between the hours of 9 p.m. and 2 a.m., thereby saving an entire day, and all negotiations were conducted through the telephone, and if such or similar arrangements could be adopted by corporate bodies I feel sure the port would considerably benefit by them.

The majority of floating docks are owned by individuals or companies who are quick to note the desires of their customers, having at the same time an eye on dividends ; with the result that on the modern floating docks we find such conveniences as the following :—

Hydraulic shores all fore and aft, these are of such a design that they not only act as ordinary shores but can move the vessel into the required position ; then there are centreing shores which automatically bring the vessel plumb over the blocks. Again, bilge shores are all mechanical, with the advantage that they can all be placed by not more than two or three men. Again, we find fitted, means for washing down with powerful hydraulic jets, both hot and cold. Powerful warping capstan and travelling cranes to expedite repairs are provided. Portable and fixed electric lights to facilitate night work, handy platforms dispensing with staging or scaffolding, etc., etc.

With this information before us one cannot but believe that the graving dock, even as now designed, is a crude and antiquated contrivance, and is it a wonder we give preference to the floating dry dock ?

I might point out some of the advantages the floating dry dock has over the graving dock in a harbour like Belfast.

1. It is much cheaper than a graving dock, costing probably one half, and the price can be definitely stated before the commencement of construction.

2. It is a self-contained structure not being affected by doubtful foundations, awkward land springs, or the nature of the ground at all, hence no contingent allowances are required.

3. It can be removed at a nominal cost should re-arrangement of the harbour be facilitated thereby.

4. The largest can be constructed in less than 12 months with certainty, from the signing of the order.

5. It can be extended from time to time at a cost per ton about the same as the original structure, and need not be a day out of commission.

6. It is a most valuable asset, as it can be sold and towed to its new home with ease and little expense.

7. It may be moved out to sea to a vessel unable to come into Harbour, and carry both itself and burden up the channel for repairs.

8. In case of war it can be taken to the base of operation and be equally as effective in any sheltered harbour as Belfast.

9. It can adopt itself to any list a damaged or sinking vessel may have that would debar a large vessel from entering even the largest graving docks yet made.

10. All round it is more accurate, safe, and labour saving than a graving dock, and as now made, quite capable of reducing the time for docking and undocking by one half.

11. The process of drying the vessel is accelerated considerably by the fact of having open ends aud being on a level with the water instead of down in a deep hole, away from the influence of air currents or the sun.

12. It can be constructed locally.

For purposes of comparison I shew side by side two sections, one representing the most modern graving dock yet constructed and the other the most modern floating dock; the graving dock can only take in a vessel drawing 27 feet on the average spring tides, whilst the latter can take one drawing 34 feet on either spring or neap tides.

	Graving Dock.	Floating Dock.
Weight of structure	84,650	6,500
Time in construction	6½ years.	1 year.
Cost, about	£350,000	£125,000

Tons of water to be pumped in order to empty dock ..	63,000	6,000
Ditto when a vessel displacing 10,000 is inside	53,000	17,000
	116,000	23,000

The space occupied by both docks is about the same, but no extended area at the side is required for the floating dock ; it would favour the utility of the floating dock if it were placed parallel with the river so that vessels could be hauled in from either ends.

With graving docks there is often a great waste of space and the docking is often attended with risks when the vessel is being hauled across the tide, owing to the general practice of having it at right angles to the river.

In conclusion, I trust these few remarks will tend to stimulate the proud desire to maintain Britain's supremacy as a naval and Maritime nation, and as Belfast leads the world in the construction of modern steamships, let us as commercial and patriotic citizens second such creditable enterprise, and at the proper time provide such graving dock accommodation that will be in keeping with the advances in naval architecture : a dry dock that will be of great service in times of peace and invaluable in times of war.

Mr. MacIlwaine said when he heard that Mr. Maxton was to read this paper he looked forward to it with great pleasure.

He never had had any experience of a Floating Dock, it might do very well for small vessels but he rather doubted if it would do so well for large ones. If Belfast is to keep the position it holds with regard to shipping it must certainly go in for Dry Dock Appliances in the port. There are vessels being built which cannot be dealt with without proper appliances and there is no doubt there will be others which it will be more difficult to deal with, and it becomes a question for the people of Belfast to make up their minds which class of Dock they will adopt.

In Proprietory Docks the representaive was anxious to get hold of a client and he was courteous, but the tendency of a corporation was to red tape. He thought the latter hardly applied to Belfast. The fact had to be accepted that Dock accommodation must be supplied by the Harbour Commissioners and it could not be in better hands.

The type of Dock, as per Mr. Kelly's drawing, has answered the requirements pretty well, and has kept pace with the reformations up to the present, therefore some very good reasons would be required for altering it. Of course Mr. Maxton mentions a lot of things which are much in favour of the Floating Docks—Mechanical Shores, Bilge Blocks to support the vessel underneath, Windlass and Cranes to lift things about the dock.

He did not know how Mr. Kelly was aware of what Mr. Maxton was going to say, Mr. Maxton says the Floating Dock is cheaper and Mr. Kelly says it is dearer ; however, that will be left for them to settle.

Mr. Maxton makes a very important point, namely, time of construction 12 months, which is very important, the Graving Dock perhaps would take 3, 4, 5, or 7 years. Then he (Mr. Maxton) claims it is moveable, it is saleable, and it is extensible, that is to say, if it is 600 feet long you can make it 800 feet long, and if it is required to be 10 feet more beam it could be done at a small cost. He (Mr. MacIlwaine) would go in for a Floating Dock if repairs to vessels were of a trifling character.

In conclusion he thought it absolutely necessary that Belfast must have a new Dock if the city is to keep in the front, and Mr. Maxton has rendered a service to the community in general by bringing facts before the public. It rests with the ratepayers. The Commissioners themselves cannot decide it if the ratepayers are against it. If a Dock is to be constructed of whatever kind, it must be a big one. Mr. Kelly has shewn us a design of something like what would be the biggest Dock in the world, even larger than the Glasgow one.

Professor FITZGERALD remarked that whatever was done in the matter of Dock Extension in Belfast should be done not necessarily with a view to the minimum of cost but the maximum of efficiency taking everything into consideration.

The Floating Dock which Mr. Maxton referred to at Nicholaieff was a very valuable one at the time, because it was the only Dock that would take up the circular Ironclads which were too large to come into an ordinary dock. All the subsequent docks that have been made there, however, have been regular Graving Docks, although the situation would have been very suitable for gridirons.

With regard to extensibility, he thought that where land was available there was very little difficulty in extending a Graving Dock.

Mr. BROWN in responding to the request of the President, said that he came to learn rather than to criticise, and had listened with great interest to the paper. Whether Mr. Maxton was dealing with some brilliant inspiration of his own like his Submerged Buoyant Bridge, or whether he took up the work of others, the audience felt it was listening to an enthusiast, and enthusiasm is always attractive and creates a sympathetic interest even in a subject of a somewhat technical and unfamiliar nature like that of this eveuing.

Although unable to criticise the details of the paper, it would seem to him (Mr. Brown) from broad general considerations that in recommending the Floating Dock of iron or steel in preference to the fixed masonry Dock, Mr. Maxton was abreast, if not probably ahead of the march of progress. The change from stone to iron in several engineering works was very marked. In roads, bridges, aqueducts, even in fences is seen this change. He rather thought Mr. Maxton had a covert contempt for the ways and means of the "stone and lime Engineer." Be that as it may the many advantages which he has pointed out as specially pertaining to the Floating Dock would seem to indicate that its adoption only waits a better acquaintance with it.

He was much struck by the remarks of Mr. Maxton respecting

the difficulties arising through the red-tapeism of Commissioners or Corporations as owners of Docks. The keen feeling of satisfaction with which he spoke of the comparative ease and facility experienced in dealing with private dock owners was very apparent, and it is quite what one would expect. Even with so respectable and respected a body as our own Harbour Board, this must be the case to some extent. It might just be pointed out that evidence of this kind was very much to the point in considering the socialistic proposals for the "Municipalization" or "Nationalization" of everything so often encountered in these latter days.

The opinion seems to be in the air that a larger dock was required for Belfast. If so, would it not be practicable that its construction and management should be undertaken by one of our shipbuilding firms, or by a Company officially formed for the purpose. If this could be shewn to be a paying speculation no doubt some of the abundant capital and enterprise in Belfast would be forthcoming to its support.

Mr. Greenhill observed that there was such a difference amongst the Engineers on the comparative utility of Floating and Graving Docks. When you get a Civil Engineer to deal with the question, he simply deals with brick and stone, and when you get a Mechanical Engineer he simply deals with iron and steel. He thought the proper way to get at the thing would be to go where these docks were being used and get the experience of those who actually used them, and also whether the Shipping Owners preferred the Floating Dry Dock or the ordinary Graving Dock, but would like to hear what was the difference, if any, in the upkeep of the two types of docks.

Mr. Heyn said that like Mr. Brown he came there to listen. Any remarks he would make would be from a Shipowner's point of view. He thought Floating Docks would be a considerable advantage in dealing with small ships. One thing was the rapidity with which the work could be effected, and the fact that in tidal harbours there is not the necessity to wait on the tide. Docking operations can be performed at any hour.

Another thing, the vessel wasn't sunk in a hole but was raised above the level of the dock, and so the drying process is more rapid. He didn't know that a Floating Dry Dock could be got for Belfast. At present he was in favour of the Graving Dock. In some places the Floating Dock has been of very great advantage to Shipowners.

Mr. Dempsey said he thought he would be more entitled to claim reasons for keeping silence than any of the gentlemen who had preceded him. The Graving Dock question was one that concerns every one in the city. He thought there should be both Floating as well as ordinary Graving Docks.

Mr. Carson said he came like some of the other members of the Corporation to hear Mr. Maxton's paper. For his own part he preferred the old system, but would not like to say anything against the new.

In briefly replying, the Author regretted the absence of Mr. Redfern Kelly who had favoured the meeting with a critical letter and plans.

Mr. Maxton explained that Mr. Redfern Kelly's plan shewing the proposed new graving dock for Belfast was very similar to that now just opened at Glasgow ; and some of the figures, for comparison between this modern Dry Dock at Glasgow, and a modern Pontoon Dock as given in the paper, should be studied. Had the Belfast Alexandra Dock been a Pontoon Dock of similar dimensions there would have been no need for another new Dock in this port, for with an expenditure of small amount it could have been altered to meet the new condition of things, whereas to alter the present graving dock was tantamount to its re-construction, and it is quite possible that the dimensions now proposed for the new graving dock will be totally inadequate for vessels built within the next ten years, and since the conception of the large dock at Liverpool it has undergone considerable increases in dimensions, and Belfast should not be satisfied with anything less than Liverpool.

Mr. MacIlwaine certainly followed the paper carefully and to his remarks little can be added, one remark, however, that the

floating dock was more suited for small than large repairs may be met by the statement that the Vulcan Ironworks of Stettin ordered their floating dock specially to lengthen two of the largest vessels afloat, which operation is considered the heaviest repair to vessels in a Graving Dock. In passing, it may be mentioned that this Stettin Floating Dock took 9 months to build and can lift the largest passenger steamer in the world, and cost £90,000 delivered at Stettin, ready for working.

Professor Fitzgerald's views *re* extensibility might undergo some change, if in extensibility is meant increase of breadth, an entire new and stronger bottom would be required for a Graving Dock. Vessels are not cramped for length in Belfast docks, only breadth, and this would put the dock out of commission for years, whereas in a Floating Dock it could be done without putting it out of commission more than perhaps a fortnight.

In reply to Mr. Brown, it would be impossible in Belfast for a private Company to get powers to construct a Dry Dock.

Mr. Greenhill's remarks are certainly true, Engineers accustomed to concrete, bricks, and stones, invariably try to use them, and Engineers accustomed to use steel avail themselves of that material. Strange that Engineers who advocate the use of concrete where ever possible have been compelled to adopt the very principle of a floating structure for the gates or caissons of Graving Docks, and no doubt by degrees will become converts and construct the whole dock of steel. He (Mr. Maxton) certainly recommend those who had only heard of Floating Docks to go and study them and observe the many advantages they possess. In reference to upkeep between the two kinds of docks there was little to choose, probably the Floating Dock would cost more owing to the greater number of mechanical appliances usually provided, and the painting, but as a matter of fact much fewer men are required to attend a large Floating Dock than are required to work the caissons alone of the Belfast Graving Dock. Forty-one men were engaged round the Belfast Alexandra Dock and on board the vessel recently in dry docking and shoring and working the caisson for a small steamer

250 feet long ; with a modern Floating Dock the same operation could be done with ease by six men.

In conclusion the author stated that it was because he had been engaged so often at the dry docking of vessels that he felt disgusted at the slow and expensive process in use at even modern Graving Docks, whereas his experience with the Pontoon Dock went to shew that at least it was advancing with the times. A leaf might be taken out of the German book of progress and note how they are availing themselves of modern methods in this as in many other instances. and old and expensive methods ought not to be retained if new, cheaper, and better methods can be got; and before adopting another Graving Dock for Belfast those interested should pay a visit to Hamburg, Stettin, Rotterdam, Amsterdam, Cardiff, Newcastle, and other places, and study the question with a sample of the Pontoon Dock before them and confer with the builders of such structures.

Hamburg, one of the largest if not the largest shipping port in the world, has but one small Graving Dock 260 feet in length; this is a very significant fact, and at the present time there are enquiries for several floating docks to accommodate the largest vessels being constructed.

The American, Japanese, Russian and Canadian governments are all asking for tenders for this class of floating dock.

Mr. Maxton thanked the audience for their patient attention, and the speakers for their friendly criticism, and likewise the builders of the largest floating dry docks, Messrs. Swan & Hunter, and others who had been good enough to furnish some particulars and plans.

NOTES ON SOME RECENT DEEP BORINGS FOR WATER AT BELFAST.

By Robert Young, C.E., J.P.

When near the end of the 18th century geology began to take its place as a science, it was largely indebted to the miner and the well sinker for the observations and facts on which its conclusions were founded, and since then vast additions have been made to its stores by the labours of engineers in their deep excavations for railways, docks, canals, waterworks, and sewers, not to omit the tunnels driven through great mountains, such as Mount Cenis and San Gothard. Lately, the trial shaft sunk on the English side for the intended channel tunnel, led up to a deep boring being made at the suggestion of Prestwick. Coal was found below the chalk, and it is the opinion of practical men that it can be raised and sold at a good profit even at such a depth. The Marquis of Downshire's search for coal at Carrickfergus led to the discovery of the important beds of salt rock. However, I wish to confine my remarks to-night to a comparatively limited area and to borings, nearly all made quite recently for water supply. These have been generally sunk by the Diamond boring apparatus which works admirably in solid rock of any degree of hardness, from sandstone to granite or porphyry. The boring tool is just an iron tube, into the lower edge of which are firmly fixed coarse diamonds which are mostly the refuse of the South African mines, and as the tube revolves an annular track is dug out corresponding with the section of the tube, *i.e.* a 6 inch tube, having $\frac{3}{4}$ inch thickness, cuts a ring $\frac{3}{4}$ inches by 6 inches, leaving a core of rock $4\frac{1}{2}$ inches diameter. This is broken off in pieces 5 to 6 feet long and brought to the surface showing the character of

the rock in a way that was quite impossible by the old jumping system under which the mud, which was the resultant, afforded only a doubtful means of judging the nature of the beds being passed through or of fixing where one ended and another began. The new apparatus has done much for science, but an equal if not a greater boon would be conferred were it possible to lift the core to the surface in precisely the same plane in which it stood when part of the parent rock. With present mechanical apparatus this is impossible. If a method can be invented for doing this, the dip of the beds, at various levels and depths shown on the cores, but now of no practical value, could be at once utilized and sections prepared which would have not only an interest for geologists but a value for the merchant, the miner, and quarry owners.

The following are notes of the most recent borings made in Belfast and its immediate vicinity, and all, with the exception of No. 13, were at points only slightly above ordnance datum and were in the Bunter Sandstone.

I have often wished that there was some official of the city instructed to collect and register all the details possible about the borings that are being made, marking the position of each on the large scale maps with a number or letter corresponding with his book, valuable information would thus be stored for the benefit of the citizens at a trifling cost.

Recent Deep Borings for water—

1. At a place now covered by Bread Street, on the Bloomfield estate, and situate about 200 yards from Beersbridge road. A 6 inch boring was carried through 308 feet Bunter Sandstone, 7 feet of hard rock, and 39 of soft rock, total depth 354 feet. Water rose 8 feet above surface of ground but was found unsuitable for raising steam.

2. Irish Distillery at Connswater, 6 inch bore 460 feet through Bunter Sandstone, 4 inch bore for 65 feet further, in all 525 feet, only a trifling quantity of water, moderately hard and fresh. The last cores brought out give strong indications of the Bunter series being pierced where it thins out upon the carboniferous

series, and it is to be regretted that the boring was not continued somewhat further to clear up this still doubtful point.

3. Avoniel Distillery, Albertbridge Road, close to the Connswater—

6 inch bore,	sandstone	275	feet
	Corraline limestone	4	„
	Sandstone	63	„
	Total depth,	342	feet

Chapman's air pump lifts 25,500 gallons per minute and quality is excellent.

4. North of Ireland Chemical Company, 56 Bond Street, off M'Auley Street, 4 inch bore through sandstone, 512 feet, 8,740 gallons per hour are being pumped.

5. Messrs. Millen & Rankin, 50 M'Auley Street, two bores, one 4 inch in sandstone, 350 feet. A large supply of good quality.

6. J. J. M'Connell & Co., Limited, Distillery off Ravenhill Road, close to the right bank of Lagan, surface 14 feet over ordnance datum, 6 inch bore through Bunter sandstone, with thin veins of marl and gypsum, 352 feet deep, 23,000 gallons of water raised per hour by Chapman's air lift pump. Analysis shows water to be soft and good.

7. John Fulton & Co.'s manufactory, Ormeau Avenue, at crossing of Apsley Street, 4 inch bore through sand, sleech, and sandstone, 420 feet, a good supply obtained.

8. Murphy & Stevenson's Factory, Ormeau Avenue, at crossing of Linenhall Street, 4 inch bore, sand, sleech, and sandstone, 400 feet, an excellent supply.

9. Public Baths in Ormeau Avenue, at crossing of Maryville Street, 6 inch bore through 90 feet of sand and sleech and 310 feet of Bunter sandstone, total depth 400 feet, on analysis proved to be pure and soft.

10. Pure Ice Company's Works, Nos. 72, 78 Great Victoria Street, 4 inch bore, at 109 feet struck a basaltic dyke and passed through into sandstone at 148 feet, struck another dyke

at 228 feet and passed through at 261 and ended in the Bunter sandstone at depth of 426 feet. A large supply of good water.

11. Grattan & Company, Ltd., Mineral Water Works, No. 68 Great Victoria Street, 6 inch bore in Bunter sandstone, 252 feet, a large yield of very pure water.

12. Brookfield Linen Company, Ltd., Factory, Courtrai Street, off Cambrai Street, 4 inch bore through Bunter sandstone, depth 400 feet, yield, 6,000 gallons per hour.

13. Sir Daniel Dixon's Saw Mills, Whitla Street, 6 inch bore in sandstone, at 200 feet water brackish, at 350 water fresh, at 400 feet salt rock reached.

14. Belfast Union Workhouse, 6 inch bore through 40 feet of soil and sand and 480 feet of Bunter sandstone, yield almost 14,500 gallons per hour, analysis shows water to be excellent.

BELFAST
Natural History & Philosophical Society.

Officers and Council of Management for 1898-9.

President:
THOMAS WORKMAN, J.P.

Vice-Presidents:

JOHN BROWN.
PROFESSOR MAURICE F. FITZ-GERALD, B.A., M.I.M.E., ASSOC. M.I.C.E.
WM. SWANSTON, F.G.S.
ROBERT YOUNG, B.A., J.P., M.R.I.A.

Hon. Treasurer:
JOHN BROWN.

Hon. Assist. Treasurer:
W. H. F. PATTERSON.

Hon. Librarian:
THOMAS WORKMAN, J.P.

Hon. Secretary:
ROBERT M. YOUNG, B.A., J.P., M.R.I.A.

Council:

JOHN BROWN.
JOHN H. DAVIES.
PROFESSOR J. D. EVERETT, F.R.S., D.C.L.
LAVENS M. EWART, J.P., M.R.I.A.
PROF. M. F. FITZGERALD, B.A., M.I.M.E. ASSOC.M.I.C.E.
JOHN H. GREENHILL, MUS.BAC.
JOHN HORNER.
R. LLOYD PATTERSON, J.P., F.L.S.
WM. H. PATTERSON, M.R.I.A.
W. H. F. PATTERSON.
THOMAS F. SHILLINGTON.
WM. SWANSTON, F.G.S.
THOMAS WORKMAN, J.P.
ROBERT YOUNG, J.P., C.E.
R. M. YOUNG, B.A., J.P., M.R.I.A.

SHAREHOLDERS

[**Denotes holders of three or more Shares.*]

*Alexander, Francis, B.E.,	Belfast.
Allworthy, Edward, Ardgreenan, Cavehill Road,	do.
Anderson, John, J.P., F.G.S., East Hillbrook,	Holywood.
Andrew, John J., L.D.S., R.C.S. Eng. University Square,	Belfast.
Andrews, Miss Elizabeth, College Gardens,	do.
Andrews, George, J.P., Ardoyne,	do.
Armstrong, Thomas, jun., Donegall Square West,	do.
Barbour, James, J.P., Ardville, Marino,	Holywood.
Beattie, Rev. A. Hamilton,	Portglenone.
Bigger, Francis J., M.R.I.A., Ardrie, Antrim Road,	Belfast.
Bland, Robert H., J.P.,	Lisburn.
Bottomley, Henry H., Cultra,	Holywood.
Boyd, William, Great Victoria Street,	Belfast.
Boyd, William Sinclair, Ravenscroft, Bloomfield,	do.
Braddell, Edward, The Limes, Malone Park,	do.
Brett, Charles H., Gretton Villa South, Malone Road,	do.
Brett, John H., C.E., Fortwilliam Park,	do.
Bristow, James R., Lismore, Windsor Avenue,	do.
Brown, John, Longhurst,	Dunmurry.
Brown, William, K. (Representatives of),	Belfast.
Bulloch, Alexander, Eversleigh, Malone Road,	do.
Burnett, John R., Rostellan, Malone Road,	do.
Byers, Prof. John W., M.A., M.D., University Road,	do.
Calwell, Alex. M'D.,	do.
Calwell, William, M.A., M.D., College Square North,	do.
*Campbell, Miss Anna (Representatives of),	do.
Campbell, James, Strandtown,	do.
Carlisle, A. M., Elmwood House,	do.

Carr, A. H. R., Rathowen, Windsor Avenue, Belfast.
Carson, John, Walmer Terrace, Holywood.
*Charley, Phineas H., Mornington Park, Bangor.
Clark, George S., Dunlambert, Belfast.
Coates, Victor, J.P., D.L., Rathmore, Dunmurry.
Connor, Charles C., M.A., J.P., Queen's Elms, Belfast.
Cowan, P. C., M.I.C.E., Downpatrick.
Crawford, William, Mount Randal, Belfast.
Crawford, William, Calendar Street, do.
Cuming, Professor James, M.A., M.D.. Wellington Place, do.
Cunningham, Professor Robert O., M.D., F. L.S., F.G.S., Mountpellier, Malone Road, do.

Davies, John H., Glenmore Cottage, Lisburn.
*Deramore, Lord, D.L. (Representative of), Newtownbreda.
Dods, Robert, B.A., St. Leonards, Newcastle.
*Donegal, Marquis of, Belfast.
*Downshire, Marquis of, The Castle, Hillsborough.
Drennan, W. H., Wellington Place, Belfast.
Duffin, Adam, LL.D., University Square, do.
Dunleath, Lord, Ballywalter Park (Reps. of), Ballywalter.

Everett, Professor Joseph D., M.A., D.C.L., F.R.S., 22 Earlscourt Square, London.
Ewart, G. Herbert, Firmount, Antrim Road, Belfast.
Ewart, Lavens M., J.P., M.R.I.A., Glenbank House, do.
Ewart, Sir Wm. Quartus, Bart., J.P., Glenmachan House, do.

Faren, Wm., Waring Street, Belfast.
*Fenton, Francis G., London.
Ferguson, Godfrey W., Donegall Park, Belfast.
Finlay, Fredk. W., Wolfhill House, Ligoniel.
Finlay, Robert H. F., Hughenden Avenue, Belfast.
Finnegan, John, B.A., B.Sc., Kelvin House, Botanic Avenue, do.
FitzGerald, Professor Maurice F., B.A., M.I.M.E., Assoc. M.I.C.E., Eglantine Avenue, do.
*Getty, Edmund (Representatives of), do.

Gibson, Andrew, Cliftonville Avenue, Belfast.
Girdwood, Catherine, Mountpleasant do.
Gordon, Robert W., J.P. (Reps. of), Bangor.
Graham, Thomas, J.P., Holywood.
*Grainger, Rev. Canon, D.D., M.R.I.A.,
(Representatives of), Broughshane.
Gray, William, M.R.I.A., Glenburn Park, Cavehill Road, Belfast.
Greenhill, John H., MUS.BAC., do.
Greer, Thomas, J.P., M.R.I.A., Seapark, Carrickfergus.

*Hall, Frederick H., Waterford.
*Hamilton, Hill, J.P. (Representative of), Belfast.
Harland, W., University Road, do.
Henderson, Miss Anna S. (Representatives of), do.
Henderson, James, A.M., J.P., Oakley, Windsor Park do.
Henderson, Mrs. Charlotte, Clarges Street, London.
Herdman, John, J.P., Carricklee House, Strabane.
*Herdman, Robert Ernest, Rosavo, Cultra.
Heyn, James, A.M., Strandtown House, Belfast.
Hind, John, junr., Cliftonpark Avenue, do.
Hodges, Professor John F., M.D., F.C.S., J.P.,
Sandringham, Belfast.
Hogg, John, Academy Street, do.
Horner, John, Mount Clifton, Cliftonville, do.
*Houston, John Blakiston, J.P., V.L., M.P., Orangefield do.
*Hughes, Edwin, Dalchoolin, Craigavad.
Hyndman, Hugh, LL.D., Windsor, Belfast.

Inglis, James, J.P., Abbeyville, Whiteabbey.

Jackson, A. T., C.E., Tighnabruaich, Derryvolgie
Avenue, Belfast.
Jaffé, Otto, Kin Edar, Strandtown, do.
Johnston, Samuel A., J.P., Dalriada, Whiteabbey.

Kennedy, Mrs. Amelia, Richmond Lodge, Belfast.
Kennedy, William (Representatives of), Kenbella House, do.

Kertland, Edwin H., Chlorine Gardens, Belfast.
Kidd, George, J.P., Lisnatore, Dunmurry.
*Kinghan, John R., Altoona, Windsor Avenue, Belfast.
Kyle, Robert Alexander, Ardstratha, Antrim Road, do.

Lanyon, John, C.E., Lisbreen, Fortwilliam Park, do.
Larmor, Joseph, M.A., F.R.S., St. John's College, Cambridge.
Leathem, Dr. R. R., Belgravia, Lisburn Road, Belfast.
Lemon, Archibald Dunlap, J.P., Edgecumbe, Strandtown, do.
Lepper, F. R., J.P., Elsinore, Carnalea, Co. Down.
Letts, Professor E. A., PH.D., F.C.S., Shirley Lodge, Cultra.
Lindsay, James A., M.A., M.D., Victoria Place, Belfast.
Lytle, David B., J.P., Bloomfield House, do.
Lytle, Joseph H., J.P., Ashleigh, Windsor Avenue, do.

Macassey, L. Livingstone, B.L., M.I.C.E., Stanley House, Holywood.
Macfarlane, John, Bladon Park, Belfast.
Mackenzie, John, C.E., Strathavon, Lisburn Road, do.
*Macrory, A. J. (Representatives of) do.
Magill, J. E., Easton Terrace, Cliftonville, do.
Malcolm, Bowman, M.I.C.E., M.I.M.E., Ashley Park, Antrim Road, do.
Maxton, James, M.I.N.A., M.I.MAR.E., The Elms, Strandtown.
Maxwell, David A., College Gardens, Belfast.
Milligan, Seaton Forest, M.R.I.A., Alberta, Malone Road, do.

Mitchell, Robert A., Marmont, Strandtown.
Montgomery, Henry C., Bangor.
Montgomery, H. H., Knock, Belfast.
Montgomery, Thomas, J.P., Ballydrain House, Dunmurry.
Moore, James, The Finaghy, Belfast.
Mullan, William, Lindisfarne, Marlborough Park, do.
Murney, Henry, M.D., J.P., Tudor House, Holywood.
*Murphy, Isaac James, Armagh.

*Murphy, Joseph John (Representatives of), Belfast.
Murray, Robert Wallace, J.P., Fortwilliam Park, do.
Musgrave, Edgar, Drumglass, Malone, do.
*Musgrave, Henry, Drumglass, Malone, do.
Musgrave, Sir James, Bart., J.P., Drumglass, Malone, do.
MacAdam, Robert (Representatives of), do.
M'Bride. Henry James, Hyde Park, Mallusk, do.
M'Bride, Samuel, Westbourne, Windsor, do.
*M'Calmont, Robert (Representatives of), London.
*M'Cammon, Lieut. Col. Thomas A., Woodville, Holywood.
M'Cance, H. J., J.P., D.L., Larkfield, Dunmurry.
M'Clure, Sir Thomas, Bart., J.P., D.L. (Reps. of),
MacColl, Hector, Kirkliston Drive, Strandtown, Belfast.
MacCormac, John, M.D., Victoria Place, do.
M'Cormick, Hugh M'Neile, Ardmara, Craigavad.
*M'Cracken, Francis (Representatives of),
M'Gee, James, Woodville, Holywood.
M'Gee, Samuel Mackey, University Street, Belfast.
MacIlwaine, John H., Bangor.
M'Kisack, H. L., M.D., College Square East, Belfast.
*MacLaine, Alexander, J.P., Queen's Elms, do.
M'Neill, George, Beechleigh, Malone road, do.
M'Knight, John P., Nevara, Chichester Park, do.

Neill, Sharman D., Rowandean, Marlborough Park, do.
Nicholson, Henry J., do.

O'Neill, James, M.A., College Square East, do.
*O'Rorke, Ambrose Howard, Dunratho, Craigavad.

Park, Rev. Wm., M.A., Somerset House, University St., Belfast.
Patterson, Edward Forbes, Adelaide Park, do.
Patterson, Mrs. Isabelle, Bonn, Germany.
Patterson, Richard, J.P., Kilmore, Holywood.
*Patterson, Robert Lloyd, J.P., F.L.S., Croft House, do.
Patterson, Robert, F.Z.S., Malone Park, Belfast.
Patterson, William H., M.R.I.A., Garranard, Holywood.

Patterson, William R., Windsor Avenue, Belfast.
Pim, Edward W., J.P., Elmwood Terrace, do.
Pim, Joshua, Slieve-na-Failthe, Whiteabbey.
*Pirrie, Elizabeth, Newcastle-on-Tyne.
Pooler, Rev. L. A., B.A., Downpatrick.
Praeger, R. Lloyd, B.E., M.R.J.A., National Library, Dublin.
Purser, Prof. John, LL.D., M.R.I.A., Queen's College, Belfast.

Rea, John Henry, M.D., University Street, do.
Rea, William R., Gardha, Fortwilliam Park, do.
Reade, Robert H., J.P., Wilmont, Dunmurry.
Riddell, Samuel, Beechpark, Belfast.
Robertson, William, J.P., Netherleigh, Strandtown, do.
Robinson, John, Sydenham Road, do.

Scott, R. Taylor, Richmond Villa, Derryvolgie Avenue, do.
Sheldon, Charles, M.A., D.LIT., B.SC., Royal Academical Institution, do.
Shillington, Thomas Foulkes, Dromart, Antrim Road, do.
Simms, Felix Booth, Queen Street, do.
Sinclair, Right Hon. Thomas, M.A., J.P., D.L., Hopefield, do.
Sinclair, Prof. Thomas, M.D., F.R.C.S. Eng., Howard St., do.
Smith, John, Castleton Terrace, do.
Smyth, John, M.A., C.E., Milltown, Banbridge.
Speers, Adam, B.SC., Riversdale, Holywood.
Steen, Robert, PH.D. (Representatives of), Belfast.
Steen, William, B.L., Northern Bank, Victoria Street, do.
Stelfox, James, Oakleigh, Ormeau Park, do.
Swanston, William, F.G.S., Cliftonville Avenue, do.

*Tennent, Robert (Representatives of), Rushpark, do.
*Tennent, Robert James (Reps. of), Rushpark, do.
*Thompson, James, J.P., Macedon, Whiteabbey.
Torrens, Mrs. Sarah H. (Representatives of) do.
*Turnley, John (Representatives of), Belfast.

Walkington, Mrs., Thornhill, Malone, do.

Walkington, Thomas R., Edenvale, Strandtown, Belfast.
Wallace, John, Chlorine Gardens, Malone Road, do.
Ward, Francis D., J.P., M.R.I.A., Chlorine Gardens do.
Ward, Issac, Camden Street, do.
Ward, John, J.P., Lennoxvale, Malone Road do.
*Webb, Richard T., Knock, do.
Whitla, Prof. William, M.D., J.P., College Sq. North, do.
Wilson, James, M.E., Oldforge, Dunmurry
Wilson, John K., J.P., Inch Marto, Marlborough Park, Belfast
Wilson, Walter H., Stranmillis House, do.
*Wilson, W. Perceval, do.
*Wolff, G. W., M.P., The Den, Strandtown, do.
Workman, Francis, Drummena, Bladon Park, do.
Workman, John, J.P., Lismore, Windsor, do.
Workman, Rev. Robert, M.A., Rubane House, Galastry
Workman, Rev. Robert, B.D., The Manse, Newtownbreda
Workman, R. D., Upper Crescent, Belfast
*Workman, Thomas, J.P., Craigdarrah, Craigavad
Workman, William, Nottinghill, Belfast.
Wright, James, Lauriston, Derryvolgie Avenue, do.
Wright, Joseph, F.G.S., Alfred Street, do.

Young, Robert, C.E., J.P., Rathvarna, do.
*Young, Robert Magill, B.A., J.P., M.R.I.A., Rathvarna, do.

HONORARY MEMBERS.

Dufferin and Ava, K.P., The Marquis of.
Stokes, Miss M., Hon. M.R.I.A., Carrig Breac, Howth, Co. Dublin

---

HONORARY ASSOCIATES.

Gray, William, M.R.I.A., Glenburn Park, Belfast
Stewart, Samuel Alex., F.B.S. Edin., Belfast Museum, do.
Swanston, William, F.G.S., Cliftonville avenue, do.

Tate, Prof. Ralph, F.G.S., F.L.S., Adelaide,	South Australia.
Wright, Joseph, F.G.S., Alfred street,	Belfast.

ANNUAL SUBSCRIBERS OF TWO GUINEAS.

Belfast Banking Company, Ltd.,	Belfast.
Northern Banking Co., Ltd.,	do.
Ulster Bank, Ltd.,	do.
York Street Spinning Company, Ltd.,	do.

ANNUAL SUBSCRIBERS OF ONE GUINEA.

Allan, C. E., Stormont Castle,	Dundonald.
Armstrong, William, Fortwilliam Terrace,	Belfast.
Barr, James, Beechleigh, Windsor Park,	do.
Barton, H. D. M., The Bush,	Antrim.
Boyd, John, Cyprus Gardens, Bloomfield,	Belfast.
Brown, G. Herbert, J.P., Tordeevra,	Helen's Bay.
Bruce, James, D.L., J.P., Thorndale House,	Belfast.
Carr, James, Rathowen, Windsor,	do.
Chambers, Walter, C.E., Waring Street,	do.
Cleaver, A. S., B.A., Dunraven,	do.
Dalton, J. P., M.A., Roseberry Villa, Antrim road,	do.
Davidson, S. C., Sea Court,	Bangor.
Dunville, Robert G., J.P., D.L., Redburn,	Holywood.
Fulton, G. F., Howard Street,	Belfast.
Gamble, James, Royal Terrace,	do.
Green, Isaac, Ann Street,	Belfast.
Hanna, J. A., Marietta, Knock,	do.
Hazelton, W. D., Cliftonville,	do.
Higginbotham, Granby, Wellington Park,	do.
Jones, R. M., M.A., Royal Academical Institution,	do.
Kelly, W. Redfern, M.I.C.E., F.R.A.S., Dalriada, Malone Park,	do.

Lynn, William H., Crumlin Terrace,	do.
Malone, John, Brookvale House, Cliftonville,	do.
Matier, Alexander S., Lorne,	Craigavad.
M'Causland, William, Cherryvale House,	Belfast.
M'Laughlin, W. H., Brookville House,	do.
Redfern, Prof. Peter, M.D., F.R.C.S.I., Lower Crescent,	do.
Scott, Conway, C.E., Annaville, Windsor Avenue,	do.
Swiney, J. H. H., B.A., B.E., Bella Vista, Antrim Road,	do.
Tate, Alexander, C.E., Rantalard, Whitehouse,	do.
Taylor, John, Brown Square Works,	do.
Thompson, John, Limestone Road,	do.
Turpin, James, Waring Street,	do.
Walkington, R. B., Carriggorm,	Helen's Bay.
Walter, Hermann, M.A., PH.D., Botanic Avenue,	Belfast.